

# The Boston Medical and Surgical Journal

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July 19, 1917

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## Original Articles

### THE USE OF THE PRECIPITIN TEST FOR THE DETECTION OF HUMAN BLOOD IN CRIMINAL TRIALS.

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AND  
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THE literature of American medicine contains only meagre accounts of the use of Uhlenhuth's precipitin test for the detection of human blood stains in criminal cases, and as each new case adds to the precedents so important in legal proceedings, we have thought it worth while to report our experience in several investigations. Before doing this, however, it is necessary to consider the work of Uhlenhuth and others in the development of this test.

The above-mentioned author published his first observation concerning precipitins in 1900,<sup>1</sup> but these referred only to the preparation of a precipitin for egg albumen.

The preparation of a precipitating serum for the detection of human blood was described a year<sup>2</sup> later, and his method at that time was carried out as follows:

Rabbits were injected with about 10 cc. of human defibrinated blood at intervals of from 6 to 8 days until 5 injections had been made.

\* Recently deceased.

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He then prepared a solution of 1-100 of human blood, and mixed 2 cc. of this solution with 2 cc. of a double normal (1.6%) salt solution in a test-tube with a diameter of 6 mm. He then added from 6 to 8 drops of the serum from the rabbit that had been previously injected with human blood, and he obtained a distinct cloudiness. He then used solutions of the serum from many animals, but found that his immune rabbit serum produced no reaction when added to these sera, nor would normal rabbit serum cause a cloudiness when added to the solution of human blood serum.

He then expressed the opinion that this reaction distinguishes human from other kinds of blood.

In a later communication Uhlenhuth<sup>3</sup> announced that this test could be made with dried and even decomposed blood, and he<sup>4</sup> followed this with an account of the use of his method in the detection of human blood stains in medico-legal cases, and the first step in this process consists in establishing the proof that the suspected material is really blood. This is necessary, since human semen, albuminous urine, and ascitic fluid will all give the precipitin test for human albumen.

Having proven the material to be blood by means of the well-known guiacum test, the demonstration of hemin crystals, and spectroscopic examination, he next proceeds to apply the precipitin test in the following manner:

The suspected material is dissolved in normal salt solution so as to produce a solution which is not distinctly colored, but which foams when shaken. To 4 cc. of this fluid he adds 5 drops

of the humanized rabbit serum, and an almost instantaneous clouding ensues, which later settles to the bottom of the tube as a sediment. A control test made with a solution of sheep's blood or that of some other animal must remain perfectly clear, and the rabbit's serum should be so strong as to cause a cloudiness and sediment in a solution of known human serum at a dilution of 1-100. The humanized rabbit serum should be perfectly clear and if cloudy or opalescent it should not be used. The reaction should take place within one hour, and those reactions which take place only after several hours or even as late as 24 hours should not be considered as positive.

This test is, therefore, a reliable test for the detection of human serum, and having shown by previous tests that the suspected material is blood, the conclusion can be maintained that the material is human blood. One exception must be admitted, however, for the blood of some species of highly organized apes will give this same reaction with humanized serum. This fact is without significance in the usual forensic case.

In a number of medico-legal cases Uhlenhuth was able to obtain positive reactions for human blood with such articles as a blood-stained stick, sand, cotton, a coat and pair of trousers, and a hatchet.

The following results, also obtained by this observer, are condensed by Nuttall<sup>12</sup> as follows:

"(6) Blood stain several years on linen, tested with anti-pig serum, gave a reaction; not so with anti-sheep, anti-horse, anti-human serum. Professor Beumer subsequently informed him that the stain was due to pig blood. (7) Dried blood (1897) acted similarly, also subsequently stated to be pig blood by Beumer. (8) Dried blood mixture (1899), reacted to both anti-pig and anti-sheep serum, diagnosis recognized as correct by Beumer, who, as in the other cases, supplied the specimens without letting Uhlenhuth know what they were until after he reported the result of his tests. (9) Blood-stain on paper found in puddle of blood on a road, reacted to anti-pig serum, a suspicion of murder being thus removed. (10) Blood-stains on penknife and handkerchief, medico-legal case, diagnosis human blood, subsequently confirmed by prisoner, who stabbed a man with a knife, explaining the spots on the handkerchief as due to his own nose having bled. (11) Blood-stains on trousers and shirt, sent from Landgericht Munich, and relating to a case of rape—diagnosis, human blood. (12) Shavings from a blood-stained box, same source as preceding, tests negative with anti-human, anti-sheep, and anti-horse serum, further tests not made, and subsequently discovered that the stains were due to roebuck blood. (13) Blood-stained waistcoat and trousers, the owner being suspected of having killed some sheep, tests negative with anti-sheep, positive with anti-fowl,

and it was subsequently proved that he had killed a fowl a day before the sheep-killing. (14) Blood-stained wood shavings from a floor, sent from Braunschweig in connection with a murder case; reaction with anti-human serum; murderer subsequently confirmed this. (15) Two samples of blood-stained cloth sent by Prof. Minovici (Medico-legal Institute, Bucharest), and 11 other articles, all blood-stained, were correctly diagnosed as subsequently reported by Minovici. (16) Blood-stained coat, tests negative with anti-human and anti-pig sera, subsequently proved to be roebuck blood-stains, medico-legal case at Marklissa. (17) Dried blood sent from Luxemburg, diagnosed human, subsequently proved to come from a suicide. The blood had been found in front of a house where the suicide lived, the body having been thrown into the Moselle (whence it was recovered) by his relatives, who wished to keep the fact hidden that the man had committed suicide. (18) Blood-stains on wool fragments from waistcoat and basket for carrying wood, diagnosed as human, confirmed by evidence in court. (19) Blood-stained trousers, diagnosis fowl blood. Prisoner suspected of stealing chickens, had claimed the spots to be due to rabbit blood; microscopic examination of the stains had, however, shown the presence of elliptical corpuscles. Comparative tests made with other avian bloods (goose, duck) showed the reaction to take place much more slowly and feebly with these bloods. (I doubt that such tests to distinguish avian bloods medico-legally can have much value, in view of my results, see p. 200.) The diagnosis confirmed in the course of the trial. (20) Three shirts and a handkerchief in connection with a murder, human blood proved to be spattered on two of the shirts. (21) Blood-stained trousers, shirt, stockings from a murder case at Strassburg Landgericht—diagnosis, human blood, the prisoner having claimed that the blood came from a cow which had knocked off a horn. (22) Blood-stains on numerous articles of clothing were diagnosed to be human and from sheep. It was subsequently proved in court that the man had committed a murder, also that he had slaughtered some sheep two weeks before the murder."

Extensive use has been made of the precipitin test in Calcutta by the Imperial Serologist, Lt.-Col. W. D. Sutherland.<sup>13</sup> The numerous examinations made by him were instituted in connection with various types of murder, assault, robbery, house trespass, rape, suicide, and other crimes, and included 2,643 offenses or alleged offenses. Various substances such as wearing apparel, instruments, tools, weapons, earth, hair, head-gear, stones, wood, and other such things, were examined; in all, 6,566. He found 5,186 specimens blood-stained, 36 with non-mammalian blood, 4,352 with human blood, and 90 with other mammalian blood such as that of the ox, buffalo, sheep, goat, horse, cat and pig.

This author by means of these examinations was not only able to aid in the detection of crime, but was often able to refute false witness of man against his neighbor.

Fowls were used for immunization, and these were found very satisfactory. On the first day of treatment the fowls received 5 cc. of the serum in the right wing vein, on the 4th day 10 cc. in the left wing vein, and on the 10th day 10 cc. in the abdominal cavity. The immunized fowl was bled on the 22d or 23d day. In testing the suspected material dilution of 1-1000 by means of the foam test in comparison with a similar known dilution of 1-1000 normal serum was used. The contact test with 2 drops of the precipitating serum in the taper tubes was carried out, and zone of reaction, or a contact ring of cloudiness must appear within 20 minutes.

Sutherland believes that with this time limit and dilution human serum can be distinguished from apes' blood, since the latter, if reacting at all, will not appear until after 20 minutes have elapsed. He made many comparative tests with orang (*Simia satyrus*), hooluek, (*Hylobates niger*), siamang (*Hylobates syndactylus*), lungoor (*Semnopithecus mitratus*), simpai (*Semnopithecus melalophus*), macaque (*Macacus cynomolgus*), pig-tailed monkey (*Macacus nemestrinus*), slender loris (*Nycticebus tardigradus*) and rhesus monkey (*Macacus rhesus*), and human serum. The human reaction took place in five minutes, but when human precipitating serum was used with any of these monkey bloods the reaction was not visible until after the expiration of 20 minutes.

This article closes with a brief résumé of 50 typical criminal cases involving murder, assault, rape, cattle-maiming, riot and other offenses, in which justice was usually done to both the guilty and the innocent.

The work of Wassermann and Schütze<sup>2</sup> was also important in emphasizing the usefulness of the precipitin test in forensic medicine. These investigators examined 23 specimens of blood by this method, and obtained a positive reaction only when humanized rabbit serum was used in connection with human blood.

They gave from 5 to 6 subcutaneous injections of 10 cc. of human serum to rabbits every 2 to 3 days, and bled the rabbit 6 days after the last injection. The suspected material was then dissolved in from 6 to 8 cc. of salt solution and divided into 2 portions. To the first portion 0.5 cc. of the immune precipitating serum was added and to the other a similar quantity of normal rabbit serum was added. This second portion acted as a control, and as additional controls hogs' and sheep's bloods were tested with the immune rabbit serum.

The tests are all incubated at 37° C. for one half to one hour, and only human blood will show a clouding and sediment.

They conclude that "the test for human

blood is specific for this blood except in the case of monkeys' blood, when it acts only after a longer time and in lesser degree."

The value of the precipitin test for human plasma protein depends upon its specificity for this particular substance, and its value is enhanced by the demonstration of a general principle applicable to all of the sub-phylum Vertebrata. This principle has been clearly established by Nuttall,<sup>3</sup> who performed an extensive series of experiments bearing upon this subject. These experiments are explained in detail in his interesting book, but a brief reference to his results is necessary in order to show the specificity of the precipitin test.

This observer first injected rabbits with the serum of the animal selected for the specificity tests, the amounts varying between 4 and 10 cc. The injections were usually intraperitoneal and were given at intervals of from 3 to 6 days, from 5 to 10 injections being given.

The antiserum was then obtained from the animal by bleeding and stored until used.

In collecting the bloods from the many animals whose blood was to be tested he used filter paper, and these dried slips were placed in salt solution so as to make a dilution when the blood was dissolved of 1 to 100. About 0.05 of a cc. of the special antiserum was added to 1 cc. of the solution of the blood to be tested, and the formation of a sediment or precipitum was noted, if present, at the end of several hours.

Nuttall's first series of experiments was performed with anti-human serum mixed with the diluted serum of the various orders of the Mammalia, Aves, Reptilia, Amphibia, and Pisces, and his results showed two distinct reactions. A faint or medium clouding occurred in a percentage varying from 4 to 100 with all of the orders of the Mammalia except the Lemuroidea and the Monotremata. This he termed the mammalian reaction, which merely indicated a general relation of the orders of the class Mammalia to each other. None of the many tests made with the other classes of Craniata gave any clouding with the anti-human serum, so that these negative results also confirm the theory of a general relationship between the various members of the Mammalia.

A much more intimate relationship, however, was demonstrated between the various members of the order of Primates, the positive reactions being noted as marked clouding or a complete reaction with the formation of precipitate when human antiserum was used with solutions of these various bloods. All of the 34 human bloods of four races gave a complete reaction, and the highest family of the sub-order Anthropoidea gave a similar result. The Simiidae, including the gibbons, orangs, chimpanzees, and gorillas, therefore, gave the complete reaction towards anti-human serum in 100% of cases.

The Cercopithecidae, including the baboons

and macaques, gave 10% of complete reactions, and 8% of marked clouding, thus demonstrating a less intimate blood relationship with man than the higher family type just mentioned.

The next family, the Cebidae, gave only 23% of marked clouding, so that the howling monkeys, the squirrel monkeys, the tee tees, the spider monkeys, and the capuchin monkeys, are less nearly related to *Homo sapiens*, while the Hapalidae, or marmosets, cannot even claim a speaking acquaintance, since they gave only the less marked general mammalian reaction in 50% of cases.

These experiments are not only of general biological interest, as showing the blood-relationship among animals, but they become important from the medico-legal standpoint when we consider that the complete reaction even with such a strong anti-human serum as 1-100 occurs only with human blood of the two highest families of the anthropoids. This is especially so since dilutions of 1-1000 and 1-10,000 are used in medico-legal tests for human blood, and the reaction must be complete, consisting of a distinct sediment at the point of contact between the solution of blood and the antiserum.

The negative tests also enable the medico-legal expert to exclude the blood of the other members of the vertebrates, since 320 tests with avian blood, 49 tests with reptilian blood, 14 tests with amphibian blood, and 19 tests with piscine blood failed to give a precipitate or even a marked clouding with a dilution of 1-100 of anti-human serum.

The medico-legist is often required to prove the presence of the blood of other animals, and the researches of Nuttall also prove that an anti-serum made from the blood serum of one sub-order of the class Mammalia will give a complete reaction only when added to the serum of this same sub-order at a dilution of 1-100.

The anti-serum of the Simiidae and Cercopithecidae reacted completely only with the serum of their own sub-order, and various members of the order Carnivora reacted only according to the same rule. Anti-cat and anti-dog serum, therefore, would react completely only with their own serum and failed to react completely with any of the other sub-orders of the Carnivora, or with members of the other orders of the Mammalia.

Among the order Ungulata anti-pig, anti-ox, anti-sheep and anti-horse serum gave the same results, and many bird and reptile sera acted in a similar manner.

Whittier<sup>9</sup> and Wood<sup>10</sup> have both used the precipitin test in murder trials in this country with positive results.

#### DESCRIPTION OF METHOD USED.

The method which was used for the detection of human blood in the cases about to be described is that described by Müller,<sup>11</sup> and this method is based upon the formation of a pre-

cipitin in a dilution of the suspected blood when this is mixed with the blood serum of an animal that has been injected with the blood serum of a human being. The injections of human serum were first injected intravenously, later subcutaneously, and finally by the intraperitoneal method. When injecting large quantities of serum by the latter method, the method advised by Müller, known as the method of Uhlenhuth, was carried out. The hind legs of a rabbit are grasped by the left hand of an assistant, and the fore legs with his right hand, the head being held downwards. The intestines thus fall as far as possible into the upper portion of the abdominal cavity, and the needle of the syringe is then less liable to puncture the intestine when the injection is made.

Kolmer<sup>12</sup> describes several methods as applicable for obtaining a precipitating serum. Of course the blood serum obtained from any of these methods must be carefully tested as to its titer and not used until it has a titer at least as high as 1-20,000. If the injections recommended are not sufficient, other doses must be given, and the experience of most workers seems to indicate that the third method, known as the slow method, will give the best results. No hard and fast rules, however, can be laid down for the immunization of any particular animal, it being understood that rabbits are used in preparing this serum. The methods described by Kolmer are as follows:

"In preparing precipitins for the purpose of identifying blood-stains, whole blood may be injected. It is better, however, to use serum only, as the immune serum may be used in diagnosis, according to the method of complement-fixation, when the presence of hemolysin is not advisable.

Serum Precipitins (Intravenous Method).—First Method.—Three injections are given—of 5, 10, and 15 cc.—on each of three successive days, and the animals are bled twelve days after the last injection has been made.

Second method.—One injection of 30 cc. of serum may be given, and followed twelve days later by bleeding.

Third Method.—A slower method consists in giving the injections at intervals of a week. After the third dose a few cubic centimeters of blood are withdrawn from the ear, and the serum titrated, as rabbits are most prone to succumb after the third dose, and in many instances the serum is of such strength as to require no further immunization. The animals are bled one week after the last injection has been given.

Doses may be given as follows:

First dose:	10 c.c. serum intravenously
Second dose:	8 c.c. serum intravenously
Third dose:	5 c.c. serum intravenously
Fourth dose:	5 c.c. serum intravenously
Fifth dose:	3 c.c. serum intravenously

**Fourth Method.**—Rabbits may be immunized by making intraperitoneal injections after any of the foregoing methods, and with the same or slightly larger doses.

The following table is a record of the various injections made for immunizing the rabbit from which the immune serum was later taken to test for human blood."

RECORD OF INJECTIONS OF RABBITS.		
Jan. 20, 1914	2.0 c.c.	Intravenous
" 24, "	9.4 c.c.	Subcutaneous
Feb. 3, "	9.5 c.c.	Intraperitoneal
" 7, "	10.7 c.c.	Intraperitoneal
" 14, "	10.0 c.c.	Intraperitoneal
" 19, "	19.0 c.c.	Intraperitoneal
Mar. 2, "	20.0 c.c.	Intraperitoneal
Hydrocele fluid		

After the above-mentioned amounts of human serum had been injected into the rabbit the animal was killed several days after the last dose, and the blood serum was obtained and filtered through a small Berkefeld filter. It is important to have the animal fast for about six hours before obtaining the serum in order to avoid the milky opalescence which often appears in a serum soon after feeding and which cannot be removed by filtration. The serum used for this test must be absolutely clear. The titration of the serum was then made in order to determine its potency, and this was carried out according to the directions of Müller, which are as follows:

" Dilutions of 1-1000, 1-10,000, and 1-20,000, respectively, of the serum or blood against which the immune serum acts are first prepared with physiological salt solution (0.8 to 0.9 per cent.). To 2 cc. of each of these dilutions add 0.1 cc. of the immune serum, without shaking. In the 1-1000 dilution a distinct clouding should appear at once, or, at the most, after one or two minutes; and, after three to five minutes, the beginning of the reaction should be distinctly recognizable in the higher dilutions. The reaction should be fully complete after thirty minutes at the most, at room temperature.

The immune serum may be preserved in sterile, hermetically sealed glass tubes, after filtering through a sterile Berkefeld filter. The serum will be rendered free of bacteria in this way, provided the filter works properly. Care should be taken to avoid using cracked filters.

A safer way is to preserve the serum, unfiltered, by the use of 0.5 per cent. carbolic acid (1-10 volume of 5 per cent. carbolic acid solution) as a preservative.

A solution of the unknown substance. Physiological salt solution only should be used as a solvent and diluent for blood-stains, etc. The dilution should be about 1-1000. In the case of blood-spots this is not always easy to estimate. Uhlenhuth gives the following directions for obtaining the proper dilution:

1. The dilution should be almost completely colorless by transmitted light.

2. It should give only a slight cloud on heating with a few drops of nitric acid.

3. It must foam freely on shaking, in spite of the high dilution.

This solution also must be crystal clear, for which purpose filtration may be employed.

*Test-tubes.*, 10 cm. long by 0.9-1 cm. wide. These must be absolutely clean.

*A test-tube rack.* The rack for 12 tubes devised by Uhlenhuth is very convenient. This has the holes for the tubes bevelled, and permits the test-tubes to hang suspended in the holes. Since the small test-tubes are often of unequal diameter, it is a good plan to select in advance tubes as nearly as possible of the same size. To avoid mixing the tubes, the holes in the rack may be numbered.

*Physiological salt solution.* Volumetric pipettes, 0.1 cc. graduated in 1-100's (the calibration extending to the point), and 1 cc. and 10 cc. in 1-10's.

*Dried blood-clots* from various species of animal to serve as controls. Dilutions approximating 1-1000 should be prepared of each of these in the same manner as the unknown substance.

*Technic.*—The following mixtures are set up in a series of test-tubes:

1. The test proper: 2 cc. unknown solution + 0.1 cc. immune serum.
2. Control: 2 cc. salt solution + 0.1 cc. immune serum.
3. Control: 2 cc. diluted blood of that species of animal whose blood is suspected to be present in the unknown solution + 0.1 cc. immune serum.
4. Control: 2 cc. unknown solution alone.
5. Control: 2 cc. diluted blood-serum of a different species of animal from that suspected to be present in the unknown solution + 0.1 cc. immune serum.

The addition of the immune serum to the various solutions is best made by placing the unknown solution into test-tubes first and then with a fine pipette adding the blood serum at the very bottom of the tube so that the solution of the suspected material or the control human blood is floated up over the surface of the serum. This produces a ring of the precipitum very much like the contact test which is made for albumen in urine by adding nitric acid to the bottom of the test-tube and floating the urine on the surface of the nitric acid. This contact ring somewhat resembles the ring of albumen precipitated in urine by the nitric acid contact test.

When the test proper and control No. 3 result positively, and all the others negatively, the presence of the blood or proteid of the species suspected in the unknown is established. If the result is negative, the species to which the unknown specimen belongs has to be determined with the aid of new antisera prepared

for each species, and employed in the manner above described.

No test is to be regarded as positive unless, as in the preliminary tests of the immune serum, the beginning of the reaction manifests itself within, at the most, one or two minutes after the addition of the immune serum as a faint, misty cloud at the bottom of the test-tube; and within five minutes, at room temperature, this must become a thick woolly cloud. At the end of another ten minutes a definite precipitate must have formed.

Any cloudiness which develops later than twenty minutes after the beginning of the reaction has no significance. It is to be noted further that the tubes *must not be shaken* during the performance of the test.

If the reaction is carried out as above described, no heterologous reactions occur. The clouding, in other words, is very strictly specific, as Nuttall has shown on the basis of 16,000 blood-tests. Only as between very closely related species—horse and ass, sheep and goats, dog and fox—can any doubt possibly arise. Beef blood and sheep's blood are readily distinguished.

The reaction can be obtained from blood in an advanced state of putrefaction, or from a clot which has been dried for a year.

#### DESCRIPTION OF CASES IN WHICH THE PRECIPITIN TEST WAS USED.

The first case in which the precipitin test for human blood was used was of the State of Maryland vs. Norman Mabel and James Parroway, which was tried in the circuit court for Cecil County on Wednesday, the 4th of March, 1914. The testimony showed that a brutal murder had been committed upon a well-known white citizen living near Salisbury in Wicomico County. In travelling from the country store to his home the victim was waylaid by the two negroes and struck over the head several times with a corn planter, the assault resulting in the death of this man. A great deal of blood flowed from the wounds of the head, and some of the garments of the suspected murderers were brought to the laboratory for examination. A spot of blood on a button of the left sleeve of the coat of one of the murderers was detected by means of the usual chemical and micro-chemical tests, and 0.4 of a milligram of the blood was scraped from the button and accurately diluted so as to make a dilution of 1-1000, 1-10,000 and 1-20,000. The first dilution was also used as a color comparison for the second test in which no accurate weighings could be made. A spot of blood was also detected on the overalls of one of the murderers, and this spot was cut out and soaked in 2 cc. of salt solution and then diluted to the color of the weighed solution from the button, which equalled a dilution of 1-1000. Other dilutions equaling 1-10,000 and 1-20,000 were then made from this original dilution.

The technic, as described above, was then carried out, including the control tests recommended, and the dilutions of 1-1000 of suspected human blood, as well as the controls, gave a distinct clouding within about two minutes and were distinct at the end of thirty minutes. The higher dilution of 1-10,000 showed a beginning precipitum in about five minutes and was well marked at the end of thirty minutes. The tests were made at the usual room temperature.

The murder was committed for the sake of robbery and about fifty dollars were taken from an envelope found in the inside coat pocket of the victim. His coat was extensively stained with blood, and the envelope addressed to him was found at a short distance from the site of the crime. Dilutions of 1-1000, 1-10,000 and 1-20,000, were made by soaking the blood-stained paper of the envelope in salt solution and comparing the lowest dilution by color to the weighed solution of dried blood of 1-1000. The dilution of 1-1000 and 1-10,000 gave a positive precipitin test, as described above.

In giving the testimony it was admitted that the test might be positive if the blood had been from some of the higher orders of apes, but with that exception the opinion was given that the test was positive for human blood. The finding of blood stains on the button of the coat and the overalls of one of the suspected criminals was considered as important evidence, and the man was convicted of murder and received a long term sentence, but was not hanged.

This murder had stirred up great feeling in the town of Salisbury and a mob attacked the jail and attempted to remove the prisoners. This attempt was thwarted, however, and the prisoners were removed to another county for safe keeping and trial.

While public opinion was still seething, a white woman living just outside of Salisbury reported to the police authorities that while alone in her house she had been attacked by a colored man, who had then made away with a few trifling articles, having not been able to find any money or valuables. Upon investigation the doorpost, the threshold of the door, a satchel and various other articles were found smeared with blood and the woman claimed that she had defended herself with a knife and had inflicted certain wounds upon the negro, who then escaped. It should be mentioned that the woman was married, that her husband was absent from home and had been used to leaving her in the house in a lonely part of the country upon various other occasions. The wood from the door, the blood-stained satchel, a blood-stained corn-cob, and a blood-stained knife were brought to the laboratory for examination, and the usual tests soon demonstrated the presence of blood upon all of these materials. Some of the blood, however, was dissolved in normal salt solution.

and examined. Somewhat to our surprise it was found that a number of the shriveled corpuscles contained nuclei, and this was confirmed by stained specimens. It was thought probable that the blood might be from a chicken, and rabbits were immunized with chicken blood. When the blood serum of an immunized rabbit had attained a strength sufficient to produce a precipitin reaction in a dilution of 1-20,000 the blood from these various materials was tested in the usual dilutions of 1-1000, 1-10,000 and 1-20,000. They all gave a marked reaction with the blood serum of the rabbit immunized with chicken blood, and the opinion was then expressed that the blood did not come from a human being but was chicken blood.

There had been a great deal of excitement amongst the public concerning this second alleged criminal attack, but when the woman was confronted with the evidence she admitted that she had staged a murder in order to keep her husband at home, as she thought that such an experience might make him more apprehensive concerning her safety in the future.

No further attempts, therefore, were made to apprehend the criminal, the public excitement subsided, and the husband presumably no longer strayed from his own fireside.

In connection with the above cases we tested some other specimens of blood with the immune serum made from the chicken's blood. These specimens were taken from several different orders of the Aves, including the pigeon, goose and duck. When dried blood was used and the dilution by weight was made, all of these specimens gave strong reactions at a dilution of 1-1000. The specimen from the goose gave a moderate reaction in a dilution of 1-10,000 and those from the duck and pigeon gave a slight reaction with this dilution. When blood serum was used instead of the dried blood the dilution was of course four times as weak, as blood loses three-fourths of its weight in drying. In this case the chicken serum with its homologous serum gave a strong reaction at a dilution of 1-100 and a moderate reaction at a dilution of 1-1000, and this result was also obtained when turkey serum was tested. When duck serum was tested the reaction was strong at 1-100 and weak at 1-1000 and when duck and pigeon sera were used the reaction was moderate at 1-100 and weak at 1-1000. It can be seen from these experiments that there is a well marked group reaction present amongst these different orders of the Aves.

The third case in which the precipitin test was used was carried out by Mr. W. A. Gunther, Director of the Co-operative Laboratory of the State Department of Health in the first sanitary district at Cumberland, Md., and we are indebted to him for the following information:

On the evening of November 26, 1915, Watson Howell was killed, or committed suicide, in a

saloon located at Reynolds. The state claimed that Howell at six o'clock in the evening was perfectly sober and was found three hours later with a bullet hole in his head, and his face and head covered with bruises and abrasions. They also claimed that the body had been moved for some distance from the spot where it fell, and this was denied by two men present in the saloon at the time, who claimed that they were asleep at the time of the shooting, which awakened them. There was a smear of blood about six feet long on the floor at the place where the man's head was lying. Scrapings of the blood stains were taken one foot apart, and dilutions of antihuman serum from 1-1000 to 1-20,000 were used. The highest dilution which gave a positive reaction was 1-16,000. The possibility of the blood having come from anthropoid apes was admitted, but with this exception it was testified that the blood must have been of human origin. The testimony was admitted as evidence, but the accused was acquitted.

The data upon the last case were also furnished by Mr. Gunther. Tony Mino was accused of having stabbed Carmelo Manone on August 17 in the subway of the Western Maryland Railroad at Cumberland. The victim died within twenty-four hours, and the prisoner was soon captured by bloodhounds. A stiletto was found about fifty feet from the place of capture. The prisoner's coat and cap contained a number of spots which gave the usual tests for blood. The highest dilution at which a positive precipitin reaction was obtained with anti-human serum was 1-9000, but the statement was made that the blood was either that from a highly organized ape or from a human being. The prisoner was convicted and sentenced to eighteen years in the penitentiary.

#### CONCLUSIONS.

The precipitin test for the detection of human blood is highly specific, and the work of Nuttall shows that anti-human serum even in as low a dilution as 1-100 will cause a reaction only in the presence of human blood or that of certain higher types of apes. There is some difference in the dilutions which have been recommended by various workers, but the dilutions of 1-1000, 1-5000, and 1-10,000, as recommended by Kolmer<sup>12</sup> would seem to be reliable indications of the presence of human blood or that of highly organized apes. This is usually satisfactory for use in criminal cases, but an occasion might arise in which it would be necessary to distinguish between monkey and human blood. For this reason it seems desirable that an accurate set of experiments should be performed in order to ascertain, if possible, a dilution of anti-human serum which is always positive for human blood and always negative for the blood of apes. It is true that Sutherland believes that the latter can be differentiated from human blood by the fact that the reaction

will not appear until after twenty minutes, but this should be confirmed and the conclusion would certainly be strengthened by invariable differences of dilution between human and ape's blood. Dried blood should be used for making such tests as it is practically always the only kind obtainable in criminal cases.

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## SYphilis IN INTERNAL MEDICINE.

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In order to emphasize its frequency, it may be well to call attention to some of the statistics in regard to the prevalence of syphilis in general. Whitney,<sup>1</sup> in San Francisco, found 6.9% of the patients attending the out-patient clinics of one hospital infected in a series of 7885 patients. Symmers,<sup>2</sup> in New York City, found syphilis in 6.5% of autopsies in a series of 4880 done at Bellevue. Of Whitney's cases, 21.8% were found in the medical clinic and 22.6% in the nerve clinic, so that nearly a half of the cases were affected with internal syphilis. I shall consider in this paper very briefly the facts concerning syphilis of the cardiovascular and renal systems, the respiratory system, and the digestive system.

## HEART AND BLOOD VESSELS.

Symmers found aortitis in 56% of autopsies on syphilitics, or more than in any other organ of the body and a quarter of these showed involvement of the coronary arteries. Lenzi states that 25% of syphilitic patients in large cities die of aortitis or myocarditis or their results as against three or four per cent. from general paresis. Brooks<sup>4</sup> states that 60% of his luetic cases die from or with serious circulatory diseases, apparently of syphilitic origin. On the other hand, Herz,<sup>5</sup> in 2000 cardiovascular cases in his private practice, where Wassermanns are not possible in many cases and where direct questions in regard to syphilitic infection were not made frequently for social reasons, found 15% showed probable syphilitic etiology.

In regard to the pathology, the lesions in the heart may be pericardial, myocardial, or endocardial, always starting around the arterioles.

Pericardial syphilis is usually fibrous, involving, in some cases, small patches and sometimes the whole sac. This may show scars later resembling the ordinary white patches and sometimes leaves an adherent pericardium. Pericarditis not infrequently is noted clinically in early syphilis, though usually it is not important. In the heart muscle Warthin<sup>6</sup> has shown that spirochetes can be demonstrated, causing every variety of parenchymatous change and, also, which is more frequent in the late-acquired syphilis, interstitial changes, always starting about the coronary arterioles, either as an arteritis or a periarteritis and going on to a fibrosis. There may be true gummata of the heart wall, but these are rare. In endocardial inflammation due to syphilis the left ventricle and septum are more commonly involved than the valve cusps and, of the valves, the aortic is the one usually involved. Signs of mitral leak are more often due in these cases to a muscular insufficiency. In the large blood vessels, as the aorta, the disease begins around the terminations of the vasa vasorum and causes a mesarteritis and periarteritis with breaking up of the elastic tissue of the media and consequent weakening of the wall, which makes a starting-place for a dilatation. In the small vessels endarteritis and periarteritis are the lesions found, the former leading to sclerosis and obliteration of the vessels. The arteries most commonly involved are the cerebral, coronary and the aorta. The latter is usually affected in its ascending part, preferably about the sinuses of Valsalva, which means probable involvement of the aortic cusps and mouths of the coronaries secondarily. Grossly, the artery wall shows gelatinous, translucent-looking areas over the places where the intima is destroyed. Later lesions show wrinkling and puckering of the intima over the fibrous media, often in radiating lines. The cerebral arteries, and especially the circle of Willis, are very frequent seats of the periarterial changes, which cause miliary aneurysms.

The time of onset of the arterial and cardiac lesions may be very early. Brooks<sup>7</sup> has notes of 24 cases in the secondary period, one before the appearance of the secondary rash. Three of these were fatal. Fordyce,<sup>8</sup> also, has collected several fatal cases in this period and he is of the opinion that, in the secondary period, when the body is overrun with spirochetes, some are lodged here and form the nidus for lesions which usually do not appear, clinically, until years later, usually from 47 to 49 years of age. Stadler and others give the average as twenty years after infection.

In regard to symptoms, in the early cases, irregularity of no definite type, and rapidity of action on slight exertion or apprehension, are often seen in secondary syphilis. Pain and tenderness on deep pressure over the pericardium are common. Irregularity of force and rhythm of the pulse, but no rise of blood pressure, unless renal

or other complications ensue, are frequent. All these lesions are seen in other acute infectious diseases without organic changes in the cardiovascular system, but from a few of them that have come to autopsy Brooks and Fordyce are of the opinion that these slight signs may be the outward signs of beginning trouble. Systolic murmurs, also, are common at this period, 40% of secondary cases, according to Grossman.<sup>9</sup> Some of these cases may become serious, as before stated, and the following is an example:—

Male, age 30. P. H. Attacks of acute rheumatism for past nine years, frequently following tonsillitis, but up to beginning of present illness never any cardiac signs or symptoms. Present illness. Two months ago sore throat and general malaise with severe pains in joints generally. One week later, typical intense syphilitic rash appeared with severe headaches and general glandular enlargement. Induration found along urethra about  $\frac{3}{4}$  inch from meatus. Wassermann strongly positive. Two weeks ago, day following third injection of salvarsan and after patient had received four doses of mercury salicylate intramuscularly, patient had chills, cough and pain in chest. Condition grew worse and on admission had to-and-fro murmur all over precordia. Two days later precordial sound had disappeared and there were signs of fluid in the pericardium. Patient was dangerously ill with septic temperature, gallop rhythm, and pulse 140 to 150. Under treatment with mercury, however, the friction sounds reappeared and the signs of fluid gradually disappeared and in two months he was discharged showing nothing abnormal in the heart on physical examination. It is fair to say that the patient received the best of hygienic and medical care with the usual cardiac remedies, but I think that Dr. T. F. Leen, under whose care he was for the cardiac trouble, agrees that, without the aid of antisyphilitic remedies, the patient would have died.

Later in the disease, in the so-called tertiary period, substernal pressure and pain are the most frequent initial symptoms of trouble in the aorta or heart. But frequently the disease of the coronaries causes sudden blocking of the vessel, or an acute dilatation, or rupture of a previously weak myocardium occurs and sudden death ensues with practically no premonitory symptoms. If the cerebral arteries are affected, there may be sudden vertigo or confused mental state, or loss of function of speech, or a weakness of the arm or hand or one foot due to changes in the circulation. If this has been the cause, rather than a complete rupture of the vessel, the circulation is often restored with complete restoration of function. Such a case is the following:—

Male, age 29. Infection 10 years ago. Treated six weeks. Tertiary lesion of throat one year ago. At that time started treatment again and took four full doses of salvarsan and courses of mercury salicylate until March, after which he neglected treatment again. Sept. 18th, while at work as a club steward, sudden motor aphasia with weakness of right hand grasp. Under inunctions of mercury and iodide of potash prescribed by his family doc-

tor, Dr. W. A. Griffin, who had previously referred the case to me, he recovered absolutely and was back to work in two weeks.

The following is a case where there was a rupture of the artery:—

Male, age 25. Seen at the City Hospital outpatient department last May. Patient was an old case, having had a short course of treatment a couple of years before when he had a secondary rash. Came to the out-patient department on account of headaches, which appeared to be syphilitic from the story. He was given a prescription for inunctions of mercury. On his way home he stopped at the L St. Bath House and while there dropped dead. At autopsy by the medical examiner, Dr. Leary, a haemorrhage, filling the ventricles and covering a large part of one side of the cortex, was found arising from a ruptured miliary aneurysm at the base of the brain, about 2 mm. in diameter.

The circle of Willis is such a complete anastomosis that if these arteries are slowly shut off there may be no symptoms or only transitory disturbance of function, as is shown post mortem where the basilar artery may be completely occluded without any history of disturbance during life. A sudden blocking of any of these arteries, on the other hand, is necessarily always fatal. Another thing to be remembered in these cerebral cases is the fact that the lesions may be multiple and, after the patient has had one attack, he may be liable to have another under sudden mental strain. In the cardiac and the aortic cases, as the lesions progress, the symptoms develop according to the particular part affected, and they differ in no way from the same lesions—myocarditis, angina pectoris, aortitis, with involvement of the aortic valves and consequent regurgitations, or aneurysm of the heart or aorta—due to other etiological factors than syphilis. Certain lesions, however, are more common in syphilis than as a result of other infectious diseases. Aneurysm of the arch of the aorta is almost invariably due to syphilis. Fordyce recalls but one instance where he could ascribe it to other causes. Other authors vary on this point, some claiming that around 80% are due to syphilis, while others maintain that an aneurysm of the arch is *prima facie* evidence of syphilis. In my own experience, I have not met with a definite aneurysm of the aortic arch, with a negative Wassermann reaction. A roughening of the aorta with practically no enlargement of the heart and very little, if any, general arteriosclerosis, is usually of syphilitic origin. Heart block is nearly always due to syphilitic interstitial or gummatous disease of the Bundle of His. Brooks found that 70% of his cases of heart syphilis coming to autopsy showed valvular lesions, mostly of the aortic valve, but fairly often the mitral was also involved. He did not see any case where the mitral was involved without the aortic, however. The symptoms which all writers connect particularly

with syphilis are tachycardia and irregularity of the heart, the latter being just "irregularly irregular," as Brooks describes it, without any type whatever. Pain under the sternum and substernal tenderness after slight exertion are also particularly common and usually denote coronary disease or myocardial dilatation. With the x-ray we generally find a broadened aortic arch, and sometimes one part of it is slightly more dilated than the rest. The heart shadow is also said to be broadened in many cases. In aneurysm of the arch due to syphilis, the heart shadow is also lengthened and Friedländer<sup>10</sup> considers a characteristic point, that the aneurysm of syphilis pulsates more markedly and the shadow is not so intense as that due to ordinary sclerosis not due to syphilis; but I should imagine that this comparative difference would be hard to make out, and not of much practical value. The Wassermann reaction is practically always strongly positive in an aggressive case of cardiac syphilis, but some of the older ones, which are not showing anything more than a murmur, with compensation complete, may give a negative.

The venous system, also, is occasionally involved in acquired syphilis, but only rarely. Fordyce notes syphilitic thrombosis of the veins of the lower extremities. Friedländer mentions that nodular and general inflammatory changes of the venous walls, which appear to leave the lumen partly occluded by consequent puckering, may occur in any veins of the body, but the portal veins and their branches are the ones chiefly affected. The lumen of the vein is puckered, and around the vein is a gray, moist, translucent appearance fading gradually into the liver tissue.

#### DIAGNOSIS.

In early syphilis if care is taken to listen to the heart and note the pulse frequently, the appearance of a soft mitral systolic with irregular heart action and, perhaps, some tachycardia and substernal oppression after exercise, probably do not always mean cardiac syphilis, but they may be warnings enough to make us spare the heart in that patient by hygienic measures. Brooks has shown us, too, that these may mean real cardiovascular disease is present. In later syphilis, the problem is more difficult, from the fact that only about 30% of cardiac cases give a history of previous syphilis in hospital cases and probably less in private practice. Often the patient, thinking that the cardiac symptoms are so long delayed after the primary lesion, never imagines the connection and, unless directly questioned about syphilis, will fail to mention that he ever had it; but more frequently, in my experience, the patient is absolutely ignorant of ever having had any such trouble. As I have already shown, the cardiac lesion is only what we might find due to any other cause, except that aneurysm of the aortic arch and

heart block are almost always syphilitic. The age of the patient, usually between 40 and 50, frequently younger, is a little under that of the ordinary arteriosclerotic. The history may reveal another acute infectious disease, such as acute rheumatism or scarlatina or typhoid as an etiological factor. Brooks and others say that a cardiac or aortic lesion, developing without other known cause and without fever, and especially if combined with a positive Wassermann reaction, in a middle-aged person is probably syphilitic. In those cases where the Wassermann reaction is negative, a provocative injection of mercury salicylate or of salvarsan may develop a positive reaction. If still in doubt, and the patient is not doing well under ordinary cardiac treatment, no harm can be done by giving him the benefit of the therapeutic test, and this is the most surely to be relied upon of all. Care must be exercised in the interpretation of the Wassermann reaction in these cases, for this only means that the patient has syphilis and not that the particular lesion in the heart is necessarily syphilitic. This brings up another very important point in the diagnosis, namely: other signs of past or present syphilis in the patient, such as tibial nodes, obscure bone or joint lesions, enlarged liver, etc. Several authors have called attention to the frequency of combined cardiac and nervous syphilis, especially tabes. Lesser<sup>11</sup> in 91 autopsies on tabetics found aortic aneurysm 18 times. Others place the frequency of combined cardiovascular syphilis and tabes as about 6 to 10% of tabetics. The cardiac lesion may be present before the onset of the tabes, but it is usually noted about four and a half to five years after the first tabetic symptom.

#### TREATMENT.

All writers at present call attention to the necessity of protecting the heart in early syphilis from sudden or severe strain, as one would do in any other acute infectious disease, in order to avoid later heart complications. Fortunately, the treatment of the earlier lesions is, usually, pretty thoroughly carried out, for then there are other and very obvious symptoms of syphilis which make the patient follow up the physician's instructions. But too much stress cannot be laid on the fact that the treatment of syphilis which is given must be intensive and prolonged. In these early cases, outside of hygienic measures such as rest, cardiac medicaments such as digitalis, etc., are not needed and are better not employed.

In the later cases, one often meets with patient in whom a thorough course of ordinary cardiac treatment, with rest in bed and digitalis and other cardiac remedies, has failed to establish compensation and the condition is pretty discouraging. It is just in such cases as this that we often see the most satisfactory improvement follow a course of intensive anti-syphilitic

treatment. If there is no immediate urgency, it is safer to commence with mercury, preferably injections of the insoluble salicylate of mercury, which is given once every five days or a week into the muscle. Inunctions do better in some cases, using the strong 50% ointment or one of its less disagreeable substitutes. In a week or two we may start with the salvarsan, which is more permanent in its beneficial effects and seems to cause no more serious collapse in these cardiac cases than the neosalvarsan, though the immediate effects of the latter may be just as striking in the way of relieving symptoms. Salvarsan should be used with great caution in these cardiac cases, beginning with a very small dose and increasing only after the effects are well borne. Most especially in cardiac cases with disease of the myocardium and irregular heart action must one use great caution with the first dose of salvarsan. Brooks reports two cases of nearly fatal collapse following the initial dose of salvarsan and I have seen one in consultation with Dr. A. D. MacLennan where salvarsan, given at my suggestion, was followed by a fatal result in a little over twenty-four hours, in a case of heart block. It is fair to state, however, that in my case the patient was nearly *in extremis* when the salvarsan was given and it was administered only in the forlorn hope that something might be done for the patient and it was evident that it must be done quickly if the life of the patient could be saved at all. In another such case I would suggest salvarsan but in a dose of only 0.1 or 0.15 g. In cardiovascular cases it seems to be better to give the doses of salvarsan far apart, continuing the mercury in the meantime. There seems to be no doubt that mercury alone will cure many cases of cardiac syphilis, but the addition of salvarsan surely does it with more speed and relieves the symptoms more quickly. It is also true that salvarsan alone will cure many of the earlier cases and possibly a few of the later ones, but it is too early to know of the permanency of these cures and, in the few where salvarsan has been used alone, its effects do not appear to be nearly so lasting as when it is backed up with an intensive course of mercury. If the case does not seem to improve under one form of mercury, it sometimes is advantageous to change to another. Anders<sup>12</sup> and Brooks both mention cases that after a while seemed to do pretty well on mercury by mouth, though these are rather the exception. As regards the duration of treatment with mercury and salvarsan, it is hard to lay down any rules. One should try, if possible, to get a negative Wassermann reaction and continue the mercury at least one year after this is obtained. But a negative reaction is sometimes not obtained at all, and if, after a couple of years, the reaction is not altered from the original strong positive, it may be better to give up and merely give an annual or a semi-annual

course of mercury to make sure that the disease does not return, provided that the limit of improvement seems to have been already obtained clinically. Often the patient seems to have become immune to the effects of mercury and it is, therefore, better to give it to the limit of tolerance and then stop for a while before giving any more.

The ordinary treatment with usual cardiac remedies should be in no way neglected, although they often do not seem to accomplish such definite results in these as in ordinary cardiac cases from other causes. In regard to iodides, the present idea is that they do not act in a specific sense, but merely absorb the products of inflammation and exudation after the cause has been removed by mercury and arsenic. From this point of view it is advised not to use them at first, but only after considerable treatment with mercury and arsenic. They do not need to be pushed very high, five to fifteen grains t. i. d. doing apparently as well as the larger doses. When once commenced they should be continued until their maximum effect is obtained, if any improvement is noticed, otherwise for a few months.

Now in regard to the prognosis in these cases. Under ordinary treatment the duration of life is usually about two years after the onset of symptoms. On the other hand, unless too far advanced, one can almost surely promise a prolongation of life by the specific treatment. In the secondary cases, with very rare exceptions, one can promise a cure in practically every case, regardless of the apparent hopelessness in some cases. In tertiary cases the inability to repair the heart muscle and the artery walls makes a cure impossible where much serious damage has been done. Post mortem, in a well treated case, one finds a fibrosis of the heart muscle, or an occluded coronary artery surrounded by fibrosis, or, if there has been a true aneurysm, this persists; and the same is true regarding serious damage to the valves, but, under the microscope, no active foci which can be diagnosed as syphilis and no spirochetes pallidae are found. Clinically the results compare very favorably with treated gummatas of the bones and other places and one can never tell how much irretrievable damage has been done until a thorough course of treatment, both with anti-syphilitic and ordinary cardiac remedies, has been tried. Good effects are often astonishing. Cases, however, where through neglecting treatment the symptoms have relapsed, do not as a rule respond so readily a second time. Where combined anti-syphilitic and cardiac remedies fail, the downward course is usually pretty rapid.

#### SYPHILIS OF THE KIDNEYS.

Albuminuria in early syphilis is by no means rare, but a true nephritis is very uncommon. Stokes,<sup>13</sup> in the last year, has described a typical case of the latter. Early syphilitic nephri-

tis comes on about the fifth month of the disease on the average, though it has been reported before the appearance of the secondary rash. The condition starts in rather suddenly and is distinguished by the very large amount of albumin, with marked anemia and oedema. But outside of some general weakness there is comparatively little disturbance of the general health. There is often rather rapid loss of weight. Fournier states that the cases go on, in about 30%, to uremia, but other authors do not find this so frequent. Most writers say that they generally get well under treatment, though Bradford has noted frequent relapses with albuminuria. The urine in these cases is slightly diminished and shows a very large amount of albumin, many hyaline and granular casts, occasional epithelial casts, occasional red blood corpuscles and leucocytes. Stengel<sup>14</sup> and Austin have made a careful study of the double refractive bodies described by Munk in syphilitic nephritis and find that they are pretty constant in the parenchymatous, but rarely occur in the interstitial forms. As this early nephritis is of the former variety, the findings of these bodies are noted, but as they also are found in a fair percentage of nephritis due to other causes, their significance would hardly be considered as great. Spirochetae pallidae have been noted in the urine of one of these cases, but this was not from a catheterized specimen. In later syphilis, Squier,<sup>15</sup> in 186 autopsies on syphilitics, found 125 with renal lesions, amyloid 36, and gummatous 6. Chronic interstitial and chronic parenchymatous nephritis, chiefly the former, are also found. Pathologically, in syphilitic nephritis, the chief characteristic is marked endarteritis with thickening of the connective tissue of the kidney and capsule (Fordyce). Spirochetae pallidae have not been demonstrated in the kidney. The diagnosis rests on the presence of a nephritis with a history of syphilis or a positive Wassermann reaction and the presence of syphilis elsewhere. There are very few cases, however, in which we can make a positive diagnosis of syphilitic nephritis without recourse to the therapeutic test. Barach<sup>16</sup> reports several cases in which the albumin has disappeared, even in cases where it has existed for three years or longer before treatment. I have seen two such cases where the albumin has disappeared under the use of salvarsan. In my opinion, some of those which do not react to anti-syphilitic treatment are really due to syphilis, directly or indirectly, but there is no way of proving this. The treatment is by salvarsan given cautiously and in small doses, followed by mercury and the iodides. The physiological dose of mercury and salvarsan must be learned by trial on the particular case, as Stokes has shown that the proper amount can easily be overstepped and an increase of the albuminuria and suppression of the urine, with a return of the edema, are produced.

#### SYPHILIS OF THE RESPIRATORY SYSTEM.

Mucous patches of the trachea are seen and a bronchitis, occurring in early syphilis and responding quickly to anti-syphilitic treatment, is probably a similar process in the bronchi; but secondary lesions of the lung are unknown. Tertiary lesions of the trachea and bronchi (gummatous of the submucous tissue) are not uncommon and may lead to ulceration or cicatricial stenosis. Tertiary syphilis of the lung is very rare, according to the pathologist, but not so uncommon, according to the clinician. Clayton<sup>17</sup> has analyzed the cases and says that they can be grouped into three classes:— 1. gummatous, which may occur anywhere but are most frequently situated near the root of the lung, and especially of the right lung and in the middle lobe. Some authors claim that these may break down in the center and discharge into the bronchi leaving cavities, but surely the more common change is into fibrous tissue with broad bands extending out into the lung. 2. A so-called syphilitic pneumonia which consists of an infiltration that may extend over the entire lobe and in which the blood vessels are much thickened. 3. What is, apparently, a later process of the preceding, fibroid induration, which consists of a proliferation of connective tissue starting around the root and extending around the bronchi and blood vessels, or occurring as nodules of fibrous tissue in other parts of the lung until the whole lung may be involved. Clayton does not believe that a case of true syphilitic phthisis, meaning a progressive destructive disease with cavity formation, has been proved. Bronchiectatic cavities are fairly frequent in syphilis of the lung and this fact aids a little in the diagnosis when they are found by the x-ray. Symptomatically, there is little difference between this condition and tuberculosis of the lung. The fever is not so common and the haemoptysis is rather rare, though several cases are reported. Levin reports one where this was the first symptom. The emaciation is usually not so marked. The duration for several years with a rather extensive process in the lung, especially if it is around the root of the lung, yet the patient does not show marked emaciation or poor nourishment, is a rather characteristic picture, and especially so when combined with an absence of T. B. in the sputum on repeated examinations, and with a positive Wassermann and other signs of syphilis elsewhere. The treatment is that of syphilis anywhere, but, according to the cases reported, if the lesion has existed for a very long time, results of treatment are unsatisfactory.

#### SYPHILIS OF THE GASTRO-INTESTINAL SYSTEM.

Symmers, in nearly 5000 autopsies, in which there were 314 cases showing signs of syphilis, found only seven cases of gastro-intestinal syphilis, of which only one was a lesion of the stom-

ach, and he considers gastric syphilis as very rare. Smithies, in 7545 cases of gastro-intestinal affections, found 25 cases, or 0.34%, of gastric syphilis. Pathologically, syphilis of the stomach begins, according to Smithies, as a dense round-cell infiltration of the loose areolar tissue of the wall, frequently with endarteritis. This progresses by infiltrating the wall of the organ generally and causing a stiff, thickened wall, or it forms single or multiple gummatous, which may ulcerate, or may form a large tumor which, if it goes on to cicatrization, may give an abnormal shape to the stomach or may cause a stenosis. Clinically, the patient may show only symptoms of chronic gastritis, but often there is a history resembling chronic ulcer of the stomach. Haematemesis is not an infrequent symptom in these cases and, in one case reported by Clark,<sup>19</sup> it was the only symptom in a fatal case. Other cases resemble carcinoma of the stomach very closely. Smithies found the hydrochloric acid in these cases not diminished, but most authors consider achylia the rule. A palpable tumor frequently is felt. A rather curious fact in some of these cases is the persistence of a good appetite and less anemia and cachexia than one would expect from such an extensive process if it were due to carcinoma. Usually the loss of weight is only about twenty pounds, on an average, which is less than we would expect in advanced cancer of the stomach. X-ray shows only a tumor or ulcer or stenosis, which is not characteristic of syphilis. Usually the Wassermann reaction is strongly positive and Smithies considers that this is the only way that we can be sure of a diagnosis, but Einhorn and Eisenman<sup>20</sup> report cases with a negative reaction. Three cases which I have seen had positive reactions and were clinically indistinguishable from cancer, so that the blood test was the only symptom which led to anti-syphilitic treatment, the effects of which were remarkably satisfactory in all three. The treatment is that of late syphilis anywhere, as these cases are almost always tertiary. In Smithies' 26 cases, the results generally were pretty satisfactory, though recurrences must be guarded against in giving a prognosis. Only four of his cases remain cured over a period of three years and three of the cases show no improvement whatever. In these latter cases it would seem as if there were some surgical condition present such as stenosis, or there may have been mistaken diagnosis. Hayem and Niles both report cases which were cured very quickly by anti-syphilitic treatment.

Syphilis of the intestines is rare, with nothing to characterize it as syphilitic. Symmers found one ulcer of the cecum in his series of autopsies and four cases of syphilitic stenosis of the rectum. The latter is more common in women. Another interesting lesion noted by Fordyce<sup>21</sup> is a periproctitis involving the surrounding tissue to such an extent that it resembled a tumor of the adjacent fascia.

#### SYPHILIS OF THE LIVER.

This is fairly frequent, occurring 142 times in 5088 autopsies done by Fordyce. Symmers in 314 autopsies on syphilitics found the liver involved in 105 cases (33.4%). Nearly one half of these cases were the so-called hepatoblastoma which appears to be more common in negroes and in women. In this condition the liver is separated grossly into numerous small lobules by scars and bands formed of fibrous tissue caused by syphilitic inflammatory changes resulting in an over-production of connective tissue. The spleen often is enlarged, also, in these cases. Clinically they are, practically, indistinguishable from cirrhosis due to alcohol. Gumma of the liver also is a fairly frequent result of syphilis. Usually they are multiple and the most common site is under the capsule on the anterior surface, where they are easily palpable. Amyloid resulting from syphilis gives a large, smooth liver clinically and, in the presence of other lesions elsewhere, is fairly frequently recognized during life. Perihepatitis, with fibrous adhesions to all the neighboring organs, is still another variety of the results of late syphilis. This may go on, as in one of my own cases, to adhesions throughout the abdomen which are most intractable to any form of treatment. In early syphilis we have a lesion which has attracted considerable attention in the last few years, namely, a parenchymatous hepatitis, similar to the parenchymatous changes in the kidney in early syphilis. Michael<sup>22</sup> has shown that they are true syphilitic changes and not due to pressure on the gall ducts, as was formerly maintained. This process may be very acute and go on rapidly to acute yellow atrophy and death, as in one of our cases at the Carney Hospital, or it may clear up with the formation of connective tissue and resulting cirrhosis. Clinically, the liver is enlarged and somewhat tender, but in the very acute cases the size is diminished. The jaundice is intense, the stools may or may not be clay colored, usually not, and the gastro-intestinal symptoms are usually mild, consisting of nausea and occasional vomiting, resulting probably from the uterus.

A good many cases have been reported in the last few years during or following treatment with salvarsan and neosalvarsan. At first these were supposed to be due to the toxic effects of the arsenic, but Milian<sup>23</sup> has shown pretty conclusively that they really are always syphilitic, corresponding to a Herxheimer reaction or to the nerve recurrences which were so much discussed a few years ago. They all improve with more mercury and salvarsan.

#### SYPHILIS OF THE SPLEEN.

During the secondary stage the spleen is very frequently enlarged, often accompanied by asthenia and fever. Later we find changes similar to those in the liver, namely: interstitial

splenitis, at first with an enlarged spleen and, later, as the contraction of the connective tissue goes on, a small spleen; amyloid spleen; also multiple gummatous. Perisplenitis is rather more common than perihepatitis, though the two often are combined. Clark<sup>24</sup> has described a case, with splenomegaly and asthenia and anemia, which resembled a case of early Banti's disease, but which quickly cleared up under anti-syphilitic treatment.

#### SYPHILIS OF THE PANCREAS.

Warthin, after finding marked interstitial changes in the pancreas in seven autopsies on cases of diabetes in whom there were, also, syphilitic changes in the myocardium, made a further study of the pancreas in a large number of autopsies in cases of apparently latent syphilis and found no one of them showing a normal pancreas. All showed marked changes in the form of a diffuse or patchy fibrosis with active inflammatory foci, corresponding to the localization of the spirochetes. This shows the necessity of investigating cases of diabetes thoroughly with reference to syphilis as a possible etiological factor. I have seen one case where the glycosuria cleared up quickly under anti-syphilitic treatment and several of these have been reported.

#### SYPHILITIC FEVER.

A few words about syphilitic fever do not seem to be out of place in a review of internal syphilis. A low grade of fever in early syphilis, generally at the outbreak of the rash or a little before it, is not uncommon. Fournier states that it occurs in about 20% of cases. The type may resemble that of rheumatic fever, especially when it is accompanied by pains in the bones and joints. Occasionally it simulates typhoid. This lasts only three or four days, and seldom goes above 100° F. Later, in the secondary stage, usually in combination with other complications, a more prolonged fever occasionally is observed which goes higher and lasts for some time. In tertiary syphilis there may be prolonged fever or short attacks of fever. These are especially noticed in syphilis of the liver. Febrile attacks in general paresis, from no apparent cause, are quite frequent. Kraus<sup>25</sup> maintains that these late fevers are due to the entrance of spirochetes into the blood stream. Taussig<sup>26</sup> claims that they are due to the entrance into the blood stream of endotoxins and dead bacteria, analogous to the fevers seen after a dose of salvarsan.

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#### A COMPARISON OF SEVERAL METHODS OF SPECIFIC EARLY TREATMENT OF ACUTE ANTERIOR POLIOMYELITIS.

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Of the cases of acute anterior poliomyelitis that came to the Haynes Memorial Hospital during the recent epidemic, 120 are included in this comparative study. They are divided into six groups: Group I was treated with three intraspinal injections of immune serum; Group II was treated similarly with normal serum; cases of Group III were injected with their own spinal fluids (autotherapy—Duncan); Group IV comprised cases on which the effect of simple withdrawal of spinal fluid was tested; Group V received no specific treatment; Group VI includes cases of which one was of doubtful diagnosis, one died of pneumonia, and the others were moribund on admission.

1. The use of *immune serum* followed the discovery by Flexner and Lewis<sup>1</sup> that experimental poliomyelitis in monkeys produced immunity against reinfection. This resistance was found by Römer and Joseph<sup>2</sup> to be due to immune substances in the monkey's blood.

This immune body has the power of neutralizing the virus of poliomyelitis *in vitro*. It was furthermore found<sup>3</sup> that serum from recovered human cases possessed curative or, at least, prophylactic properties if injected into monkeys within twenty-four hours after they had received an injection of virus. The treated animals did not develop the disease, whereas the control animals did.

The first application of this experimental knowledge in the treatment of human cases was made by Netter,<sup>4</sup> who treated thirty-two cases by intraspinal injection of the immune serum.

He gave usually eight successive daily injections and obtained his serum from cases who had recovered from the acute stage three weeks to many years previously. He feels that the serum is decidedly beneficial, especially if treatment is begun before the fourth day of the paralysis.

Sophian<sup>5</sup> treated four cases and was favorably impressed with the results obtained. Wells<sup>6</sup> reports 15 cases, some of which received the serum intraspinally, others intravenously, and still others intramuscularly. He gives his results as either death or "recovery," and feels that the serum has been beneficial, especially when given intravenously in large doses and followed by withdrawal of spinal fluid. Four deaths out of the fifteen cases, a percentage of 26.7, is hardly to be considered encouraging. At any rate, the number of cases is too small and is not controlled by untreated cases, so that no unassailable conclusions are possible.

Zingher<sup>7</sup> feels that immune serum is useful, particularly when given in the preparalytic stage. He is not so sure, however, of the results obtained if the serum is applied after the development of paralysis, stating that "it is difficult to forecast . . . what the natural result of the disease would have been in these cases."

Amoss and Chesney<sup>8</sup> report 26 cases in considerable detail. Twelve of them received immune serum after paralysis had developed, and fourteen were injected during the pre-paralytic stage. Of the twelve paralytic cases, one died ten hours after the serum injection, two showed extension of paralysis, and in the remainder the paralysis receded. The authors do not seem to be very enthusiastic over these results. Needless to say, a parallel series with similar results could easily be drawn up from untreated cases. The pre-paralytic cases will be discussed later.

LeBoutillier<sup>9</sup> believes that immune serum therapy is productive of some good "if used on the first or second day of the acute paralytic stage in doses ranging from 5 to 15, or even 30 cc., either intraspinally, intravenously, or intramuscularly." The number of cases treated by him, and other information essential for a correct estimate of the value of his conclusions, are not given.

Roby<sup>10</sup> gave intramuscular injections of convalescents' whole blood to one case and of normal blood to two cases. He frankly says that no conclusions can be drawn from so few cases.

2. *Normal serum*, either human or animal, is supposed to exert a beneficial effect by the excitation of a polynuclear leucocytosis in the spinal fluid. Sophian<sup>5</sup> used horse serum in ten cases. He compares the results with those obtained in four cases receiving immune serum, and concludes that horse serum is at least as efficient as immune serum. No untreated controls are cited by him, so that, in spite of his small number of cases, he may have determined that horse serum and immune serum are equally

efficient, but he cannot be said to have proved the value of either. Place<sup>11</sup> reports having used horse serum, as well as salvarsanized and mercurialized sera at the Boston City Hospital, without apparent beneficial results. Le Boutilier,<sup>9</sup> too, considers normal serum useless.

Zingher,<sup>7</sup> on the other hand, recommends normal serum, although he considers it less valuable than immune serum.

3. The subcutaneous *reinjection of the patient's own spinal fluid* is recommended by Duncan,<sup>12</sup> and is based upon alleged good results obtained from the use of the method in the treatment of cerebrospinal meningitis.

4. Simple repeated *withdrawal of spinal fluid* to reduce pressure was advocated by Römer and also by Koplik. Wynkoop<sup>13</sup> states that it is of immediate benefit before the onset of paralysis if the spinal fluid pressure is increased, and Le Boutilier<sup>9</sup> claims that it will relieve pain in a large percentage of cases.

Aside from the methods used in this study, two others deserve mention, although I have no experience with them. One is the administration of hexamethylenamin or urotropin, recommended by Flexner<sup>14</sup> as being the "only drug which has shown any useful degree of activity." Fraser,<sup>15</sup> however, after treating 22 cases by giving 0.3 gm. urotropin 3-4 times daily, states that in "no instance did this treatment appear to cut short the acute stage, and in no instance was there evidence of more satisfactory or more rapid recovery in the paralyzed parts." This result is in accord with the fact that hexamethylenamin acts as a germicide in an acid medium only, as, for instance, the urine, whereas the spinal fluid and blood are alkaline in reaction. Lovett is quoted by Barber<sup>16</sup> as reporting three children of one family. "The first child received no hexamethylenamin, the second had a little, and the third had large doses from the beginning. The first child was severely paralyzed from the waist down, the second had weakness of the legs and back for a few months, and the third had no muscular involvement." Barber remarks that after "such an observation, its use early in suspected cases seems highly desirable," which again demonstrates the pernicious influence of drawing conclusions from too meager data. Le Boutilier<sup>9</sup> abandoned it as useless after trying it for two and a half months.

Another method of drug therapy is the administration of adrenalin or epinephrin, of which Meltzer<sup>17</sup> is the chief advocate. This preparation is given intraspinally to reduce the peri-inflammatory edema and active hyperemia. Lewis<sup>18</sup> reports 77 cases treated in this way with results that led him to recommend its use. To the reader of his article the cause of his optimism is not made clear. Hoyne and Cepelka<sup>19</sup> used epinephrin chlorid in several early cases and noticed immediate improvement in some of them. This, however, "was seldom

permanent, but gradual improvement in some cases seemed to be more rapid." Place<sup>11</sup> reported using the drug without favorable results, and Le Boutillier<sup>12</sup> considers his own results questionable, because it seemed to him impossible to have the solution reach the upper part of the cord if the lesion was high. Nevertheless, he recommends its use until a better method is found, and feels that in combination and alternation with immune serum, it is beneficial. If the drug is of use, it probably finds its sphere of usefulness in the prevention of fleeting paralysis, especially of the respiratory centers, due to simple hyperemic pressure, rather than in exerting an influence upon paralysis caused by direct affection of nerve cells.

The appended tables, giving a few important facts about the cases at the Haynes Memorial, need practically no explanation. The results are tabulated under the headings: died, not improved, slightly, moderately, or markedly improved. *Table I* contains 20 cases treated with "immune" serum. The amount of serum injected varied from 2.5 to 15 cc. per dose. The donors were individuals who had recovered from the acute stage of the disease two weeks to five years previously.

*Table II* shows 16 cases who received normal serum intraspinally. The amount of serum injected varied from 0.5 to 13 cc. Polynucleosis, which is supposed to be the cause of any benefit derived from this procedure, was found in all cases after the serum injection, ranging from over 100 to between 4000 and 5000 per emm. (Immune serum gave the same reaction.)

*Table III* comprises 20 cases treated with autotherapy. The spinal fluid was reinjected immediately after withdrawal. The site of the injection was the subcutaneous tissue over the seventh rib in the posterior axillary line. With the exception of an occasional larger dose (to 7 cc.) in some of the older patients and a few smaller doses (as low as 1 cc.), when the amount of fluid obtained was no larger, the dose was 5 cc.

*Table IV* contains 20 cases, each treated by three lumbar punctures at 24-hour intervals. The amount of fluid drawn per puncture varied from 0 to 30 cc.

*Table V* is made up of 28 cases, untreated except for general measures such as were accorded all others.

*Table VI* contains 14 cases, in one of which the diagnosis was doubtful, one died in three weeks of pneumonia, and the others died within 2 to 48 hours after admission.

The results recorded in these tables were nearly all observed at the end of six weeks, when most of the patients left the hospital. The immediate effects showed no apparent differences in the various series. A comparison of the results obtained shows, I think, that none of

the measures used had any favorable influence whatever upon the progress or outcome of a single case.

Whether or not treatment instituted before the appearance of paralytic symptoms is useful, remains to be determined. Flexner and Lewis<sup>13</sup> were able to prevent the development of poliomyelitis in monkeys if they injected immune serum within 24 hours after the animals were infected. Since the incubation period averages eight days, it would seem that the time for effective serum treatment is long past when the first symptoms make their appearance. Furthermore, the mere failure of paralysis to develop after serum treatment can certainly not be adduced to prove the efficacy of this procedure, because many so-called abortive cases never develop paralysis and recover without treatment. It would be necessary to show that untreated cases go on to paralysis in greater numbers than do treated ones.

Zingher<sup>7</sup> reports 54 preparalytic cases, treated with immune serum, of which only ten developed paralysis, whereas of twelve untreated cases, seven became paralytic. Opposed to this is a series of 24 preparalytic cases reported by Place,<sup>11</sup> sixteen of which were left untreated and eight got intraspinal "immune" serum. Three of the treated cases and only one of the untreated ones developed paralysis, showing that the serum treatment was certainly not capable of preventing this complication. Place stated that his series of cases was too small to serve as a basis for definite conclusions, and the same objection may be advanced against Zingher's twelve untreated cases. Zingher himself admits that it is not easy to state "how many of the patients treated with immune serum would have remained free from paralysis without serum treatment," and that the "results and the conclusions from any form of treatment in a disease which is so variable in symptomatology and in prognosis, both as to life and disability, must be given with reserve."

Of the fourteen cases treated in the preparalytic stage by Anoss and Chesney,<sup>8</sup> two developed respiratory paralysis and died, two acquired partial paralysis of certain muscle groups, and ten recovered without paralysis. No controls are cited, so that the series is of little value, particularly in view of the better results observed by Place in his series of untreated preparalytics.

In conclusion, I would say that not only must the various measures employed in this study be looked upon as useless, at least after the onset of paralysis and under the conditions under which the investigation was carried out, but the manipulation of the sufferer necessarily attendant upon lumbar puncture causes great pain, and would seem to be permanently harmful in view of the great need of rest during the early stage of the disease.

TABLE I. TWENTY CASES TREATED WITH "IMMUNE" SERUM.

TABULAR NUMBER	SERIAL NUMBER	NAME	AGE	PARALYSIS	AMOUNT INJECTED (cc.)			IMPROVEMENT
					1	2	3	
1	11	E. W.	5	Both legs, bladder	9.0	0.0	0.0	Marked
2	13	W. D.	4	Left face, left arm	8.0	10.0	9.0	Marked
3	15	R. G.	2½	Both legs partial	6.5	5.0	5.0	Moderate
4	16	G. S. B.	12	Both legs, deglutition	6.5	10.0	9.0	Marked
5	20	C. F.	3	Both legs, (esp. left), left arm, bladder	9.0	5.0	3.5	Moderate
6	22	C. L.	10	Both arms	3.0	5.0	4.0	Slight
7	24	A. A.	16	Right leg, abdomen weak	4.0	5.0	5.0	Slight
			mos.					
8	25	P. C.	10	Both legs, both arms partial, thorax, larynx	5.0	5.0	5.0	Died (in 6 weeks)
			mos.					
9	31	J. C.	2	Both legs, esp. left	2.5	4.0	5.0	0
10	32	H. S. T.	3	Right leg partial	5.0	5.0	7.0	Moderate
11	34	E. M.	3	Both legs, right arm, all partial	5.0	5.0	8.0	Moderate
12	35	E. M.	5	Both legs partial	5.0	5.0	7.0	Moderate
13	38	I. C.	1½	Left leg partial, right face	5.5	6.0	4.5	Moderate
14	41	A. H.	2	Both arms and legs partial, post. trunk, larynx, bladder, rectum.	4.0	11.0	6.0	Marked
15	44	A. L. I.	3	Both legs, esp. right	8.0	7.0	7.0	Marked
16	46	J. M.	2	Both legs partial	7.0	6.0	7.0	Moderate
17	48	J. K.	3	Both legs partial, post. trunk, neck	6.0	8.0	6.5	Marked
18	50	M. B.	24	Both legs, esp. left	14.0	15.0	15.0	Moderate
19	51	M. M.	4	Left leg partial, post. trunk	5.0	6.5	0.0	Marked
20	75	R. H.	1½	Neck and back partial	5.0	5.0	6.0	Marked

TABLE II. SIXTEEN CASES RECEIVING NORMAL SERUM.

TABULAR NUMBER	SERIAL NUMBER	NAME	AGE	PARALYSIS	AMOUNT INJECTED (cc.)			IMPROVEMENT
					1	2	3	
1	89	E. A.	7	Left face, larynx, neck	5.0	?	6.0	Died — 6 days
2	90	H. C.	1½	Right arm partial, neck	3.0	8.0	6.5	Marked
3	92	M. G.	2	Left face	5.0	9.0	6.0	Moderate
4	95	A. T.	2½	Both legs, esp. left	5.0	6.5	8.0	Slight
5	96	E. L.	12	Post. trunk	9.0	6.0	0.5	Marked
6	97	A. D.	3	Both legs, trunk	8.0	7.0	0.0	Moderate
7	99	D. S.	3	Post. trunk, both legs, esp. right	8.0	5.0	8.0	Marked
8	100	M. E. S.	11	Both legs slight, left arm partial	10.0	0.0	0.0	Marked
9	104	J. L.	14	Both legs, esp. right	10.0	13.0	4.0	Marked
10	105	L. C.	2	Both legs, esp. right, right arm partial	6.0	6.0	4.0	Moderate
11	109	M. J.	1	Both legs, trunk	4.0	10.0	0.0	Slight
12	110	J. P.	2	Left leg	7.0	5.0	0.0	Slight
13	111	J. Q.	5	Both legs partial	5.0	8.5	10.0	Marked
14	117	W. B.	3	Right leg	6.0	5.0	6.0	Moderate
15	118	J. S.	2½	Both legs partial	6.0	5.5	4.0	Moderate
16	120	M. O.	1½	Neck, thorax, larynx, left arm	6.0	4.0	0.0	Moderate

TABLE III. TWENTY CASES RECEIVING SUBCUTANEOUS INJECTIONS OF SPINAL FLUID.

TABULAR NUMBER	SERIAL NUMBER	NAME	AGE	PARALYSIS	AMOUNT INJECTED (cc.)			IMPROVEMENT
					1	2	3	
1	10	E. F.	4	Left leg complete, right partial	5.0	5.0	0.0	Moderate
2	12	J. M.	5	Right leg complete, left partial	6.0	5.0	5.0	Marked
3	18	S. S.	26	Right leg partial	6.5	5.0	6.5	Marked
4	19	C. T.	1½	Both legs, esp. left, left arm and thorax partial	5.0	5.0	5.0	Moderate
5	21	A. F.	4	Both legs partial	5.0	5.0	3.0	Slight
6	23	C. S.	4	Tongue, larynx, left face, deglutition	5.0	5.0	5.0	Moderate
7	26	A. Q.	2	Both legs partial, esp. left	5.0	5.0	5.0	Marked
8	27	E. I.	15	Both arms partial, esp. right, left leg	5.0	5.0	7.0	Moderate
9	29	E. P.	2	Right arm partial, left leg partial	5.0	5.0	4.5	Marked
10	30	A. R.	1	Both legs, left arm partial, thorax weak	4.0	5.0	5.0	Slight
11	33	L. C.	2½	Right arm slight weakness	3.0	1.5	2.5	Marked
12	36	W. M.	7	Mastication only	5.0	5.0	5.0	Marked
13	37	J. C.	3	Both legs, esp. right, bladder, both arms slight	5.0	5.0	1.25	Moderate
14	40	A. P.	2	Both legs	5.0	5.0	5.0	Slight
15	42	R. H.	2½	Left leg weak	5.0	1.0	1.0	Marked
16	43	W. M.	2	Left leg and left arm partial	5.0	4.0	6.5	Marked
17	47	F. R.	1½	Both legs, left arm, post. trunk, neck	5.0	5.0	0.0	Slight
18	49	F. D.	5	Left face	5.0	1.5	5.0	Slight
19	52	M. F.	5	Both legs, esp. left	5.0	5.0	4.5	Moderate
20	67	W. A.	10	mos. Left leg	5.0	5.0	5.0	Moderate

TABLE IV. TWENTY CASES TREATED BY TRIPLE LUMBAR PUNCTURE.

TUBULAR NUMBER	SHIELD NUMBER	NAME	AGE	PARALYSIS	AMOUNTS DRAWN (cc.)			IMPROVEMENT
					1	2	3	
1	55	F. F.	2	Both legs, esp. right	11.0	15.0	1.0	Slight
2	56	J. N.	8	Both legs, esp. right	14.0	15.0	12.5	Marked
3	57	J. C.	3	Both legs, esp. left, neck	13.0	4.0	3.0	Marked
4	59	V. D.	14	Both legs, partial	1.5	1.0	3.0	Moderate
			mos.					
5	60	E. F. R.	4	Both legs slight, esp. right	8.5	0.0	3.0	Marked
6	61	R. F.	3	Both legs, esp. left, left arm, larynx, tho- rax moderate	3.0	15.0	4.0	Slight
7	62	G. F. L.	2½	Both legs, esp. right	30.0	11.0	2.0	Moderate
8	63	E. Y.	2	Both legs, esp. right, right arm partial	7.0	4.0	2.0	Marked
9	64	H. B.	3	Both legs partial	15.0	35.0	8.0	Marked
10	65	C. B.	1½	Bxth legs, esp. left	?	13.0	3.0	Moderate
11	66	J. R.	2	Both legs partial	14.0	24.0	7.0	Moderate
12	68	P. S.	3½	Both arms partial	5.0	1.0	?	Marked
13	70	G. H.	5	Left face	5.0	2.0	9.0	Moderate
14	73	A. B. H.	1	Right leg	15.0	2.0	4.5	Moderate
15	74	M. A.	5	Both legs, esp. left, bladder slight, post. trunk moderate.	15.0	30.0	12.0	Moderate
16	76	C. D.	5	Right arm partial	12.0	5.5	1.0	Marked
17	77	T. F.	3½	Both legs, esp. right	?	?	?	Moderate
18	79	E. M.	2	Both legs, esp. left, right arm, right face	10.0	7.5		Died — 4 days
19	83	E. P.	10	All four extremities, trunk, thorax	10.0	13.0	6.5	Died — 8 days
20	88	B. B.	3	Both legs partial, post. trunk	17.0	11.0	0.5	Marked

TABLE V. TWENTY-EIGHT UNTREATED CASES.

TUBULAR NUMBER	SHIELD NUMBER	NAME	AGE	PARALYSIS	IMPROVEMENT
1	1	M. Y.	2	Right leg	Marked
2	2	L. H.	23	Both legs	Moderate
3	3	L. C.	15	Both legs, bladder and bowel	Moderate
4	6	F. V.	3	Partial, both legs	Marked
5	7	E. B.	1	Complete right arm, partial left arm	Slight
6	8	N. B.	8	Right arm complete, left arm partial	Moderate
7	9	G. A.	2	Both legs partial	Marked
8	14	C. M.	8	Both legs, esp. right	Marked
9	17	R. H.	18	Both legs, esp. right	Slight
10	45	M. D.	2	Right face	Slight
11	53	A. M.	1	Right arm almost complete, left, slight weakness	Slight
12	60	F. N. C.	14	Both legs, right arm partial	Moderate
			mos.		
13	81	E. B.	5	Both legs partial	Marked
14	82	J. H.	4	Left leg partial	Marked
15	84	M. F.	11	Neck, thorax, both arms, esp. left	Slight
16	85	A. J.	14	Both legs, esp. left, thorax, neck, larynx	Died
			mos.		
17	86	H. C.	7	Both legs, esp. right	Moderate
18	87	D. S. W.	6	Right face, both arms, esp. left, neck, tho- rax	Marked
19	94	E. G.	5½	Left leg	Moderate
20	102	E. F.	4	Left leg slight, post. trunk	Marked
21	106	S. M.	6	Right leg partial	Slight
22	108	W. J. R.	4	Both legs, both arms slight, post. trunk, neck	Slight
23	112	E. W.	1	Thorax, both arms, neck, larynx, left face	Moderate
			slight		
24	113	I. M.	10	Both legs partial	Marked
25	114	H. E.	19	Both legs, esp. right, bladder	Slight
26	115	L. W.	6	Deglutition, diaphragm, right face slight	Marked
27	116	D. B.	9	Left face partial, anterior neck	Moderate
28	119	J. M.	25	Both legs, esp. left, bladder, thorax, both arms.	Moderate

TABLE VI. SIXTEEN CASES NOT INCLUDED IN OTHER TABLES.

TABULAR NUMBER SERIAL NUMBER	NAME	AGE	PARALYSIS	REMARKS
1 4	G. W.	7	Both legs, larynx, both arms partial, whole trunk	Died on day of admission
2 5	M. F.	2½	0 (Left peroneals said to have been affected 4 days before admission)	Doubtful diagnosis
3 28	M. M.	16	Both arms and legs, thorax	
4 37	H. W.	7	Both legs, both arms, esp. left, larynx, thorax	
5 54	R. J. B.	3	Both legs, both arms partial, larynx, neck, thorax, post. trunk	
6 58	F. M.	14 mos.	Both legs, esp. right.	Died in 3 weeks of pneumonia
7 71	H. E. S.	4	All extremities, thorax, larynx, sphincters	Died 2 hours after admission
8 72	H. G.	2½	Both legs, right arm, left arm partial, thorax	Died within 48 hours
9 78	G. H.	14 mos.	Both legs and left arm partial (Temp. 109°)	Died within 48 hours after admission
10 80	M. G.	25	Both arms, thorax, post. trunk and abdomen, speech	Died within 48 hours after admission
11 91	G. S.	1½	Larynx, neck, thorax, palate	Died on day of admission
12 93	E. K.	26	Both legs, esp. left, both arms, whole trunk, voice	Died within 24 hours after admission
13 98	S. C.	5	Left face, thorax, larynx (convulsions, Temp. 106.2°)	Died within 24 hours after admission
14 101	W. C.	4	Both arms slight, larynx, neck, thorax	Died 3 hours after admission
15 103	D. S.	16 mos.	Right arm slight	Died in convulsions 24 hours after admission
16 107	J. S.	2	0 (Fever, vomiting, headache, convulsions—Another case in same family)	Died in convulsions within 48 hours after admission

TABLE VII. SUMMARY.

GROUP	TREATMENT	NUMBER OF CASES	IMPROVEMENT				
			MARKED	Moderate	Slight	0	DIED
I.	"Immune" Serum	20	8=40%	8=40%	2=10%	1=5%	1=5%
II.	Normal Serum	16	6=37.5%	6=37.5%	3=18.75%	0	1=6.25%
III.	"Autotherapy"	20	8=40%	7=35%	5=25%	0	0
IV.	Lumbar Puncture	20	8=40%	8=40%	2=10%	0	2=10%
V.	0	28	10=35.7%	9=31.6%	8=28.6%	0	1=3.8%

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## TECHNIC AND INTERPRETATION OF DENTAL ROENTGENOGRAMS.\*

BY HERBERT MCINTOSH, M.D., BOSTON.

DENTAL radiology is a special branch of the larger field of Roentgen diagnosis. For its successful pursuit it requires something of the special qualifications of the dentist—mechanical skill and deftness in working in contracted areas. There are difficulties which do not present themselves in other fields of x-ray diagnosis. A formidable difficulty, for instance, is the varying character of the surface against which the film is laid. Nothing varies more in different patients than the conformation of the palate against which the film must be laid when radiographing the teeth of the superior maxillary region. This necessitates a different position of the tube for each case, since it is necessary to avoid foreshortening or lengthening of the roentgenogram. As the problem of root canal fillings is one of great importance, and a never-failing source of anxiety to the dentist, it is necessary to furnish him correct *data* with regard to the size and direction of these canals. It can readily be seen that with roots foreshortened or lengthened the dentist may be misled, for instance, in determining the length of a root canal which, after several attempts at filling, may still remain unfilled.

A common source of error for the radiographer is to forget that the plane of the cheek is not exactly the plane of the tooth or the palate, though there is considerable correspondence between these planes in the skeleton. Where covered with muscle and other structures, these planes diverge somewhat more, though less than is commonly supposed. Where the plane of the film and that of the object to be radiographed diverge, the rule is to bisect the angle made by the plane of the film and that of the object, and so place the tube as to throw the rays at right angles to the bisecting line. The resulting radiograph represents the exact length of the object radiographed. Foreshortening and elongation of root canals are thus avoided.

A practical difficulty presents itself in the intolerance which many throats offer to the proper placing of the films. I have never found it necessary, however, to anesthetize the mouth and throat, patience and thoughtfulness usually enabling the operator to secure a satisfactory film.

I have never found film holders of any value whatever. The finger of the patient holds the film admirably in place, folds it into the desired position and keeps it there firmly. It is, of course, desirable that exposures should be brief to avoid movement resulting from breathing during the exposure. Movement obliterates the picture of the root canal, always of the greatest importance. Exposures lasting from three to

five seconds furnish excellent results. In my judgment the film should not be too rapid. Powerful generators and slow films produce the best results.

It is of great importance so to place the film in the mouth as to get a position well beyond the apices of the roots. Inflammation shows itself first generally at the foramen of the tooth.

In order to obtain fine detail in the dental film it is necessary to keep the vacuum in the tube low. As tubes tend with use to increase their resistance to the passage of the current, this is a consideration of the highest importance. High tubes produce a flat picture with little differentiation of detail. A dental roentgenogram is a miniature, and depends for its value upon accuracy and beauty of detail. A tube, therefore, with the best regulating device on the market and a rather fine focus will aid in securing the best results. The tube stand should furnish a small diaphragm and cylinder for dental roentgenography.

Plate pictures are of no value whatever in dental radiography, except under unusual conditions. The shadows are necessarily superimposed to a considerable extent, and distortion is unavoidable. They are, therefore, rarely employed in dental roentgenography.

Films should be mounted upon cardboard or celluloid of suitable size for filing in cabinets. Small view boxes for studying films by transmitted light can now be obtained from supply houses, and are convenient and serviceable.

A subject of much interest is stereoradiography of the teeth. To introduce the third dimension into a shadow picture is to separate the various levels, which otherwise lie upon a flat surface and furnish no data for determining their third dimension relation. For radiographs of other parts of the body this presents no great difficulty, since the plate being in a fixed position it is necessary only to change the position of the tube in order to get a second view. In the mouth, however, the film has to be withdrawn, and a second introduced in exactly the same position as the first without change of position of the head itself. This offers many practical difficulties, so that failure to secure satisfactory results is frequent. Successes are, however, possible, and when obtained very satisfactory. The relation of unerupted teeth, the position of roots and fillings and many other obscurities may be thus cleared up.

The discovery that so-called rheumatic conditions and other disturbances of metabolism may have their origin in focal infections at remote points in the body has directed attention to the teeth as one of the sources of these troubles, and the extensive roentgenography of the teeth, which has become a routine procedure with many physicians, makes the interpretation of dental films of very great importance. What is the significance of the dark areas so frequently found at

\* Read before the New England Alumni Association of the New York City Medical College, April 18, 1917.

the roots of teeth? The healthy alveolus presents a mottled appearance due to the unequal deposit of lime salts. Where the alveolus has become unhealthy there is a dark area which entirely alters the picture. To what is this change due? We are always right in answering that it is due to absorption of the alveolar process. But we are not justified in answering always that it is due to the presence of pus. Here, I think, a serious error may arise, for while there may have been pus in the area at some time or other, it does not follow that there is pus now. Pus always produces absorption of the process, but if the infection has ceased, the destroyed area may show a dark spot on the film for perhaps a year or two years longer, until nature has infiltrated the tissues with the bony deposit.

Another error of interpretation may arise from the fact that the tissues through which the ray passes are of varying degrees of thickness, and produce occasionally dark areas which suggest an infective process. These occurring over the foramina of teeth may lead to errors of diagnosis. Thus the natural thinness of the lower edge of the mandible, the dark line of the inferior alveolar canal, the circular shadow of the mental foramen, the shadows above the floor of the antrum, and the dark areas above the superior incisors may mislead the untrained eye. Further confusion may result from the high lights produced by the edge of the zygomatic bone, sometimes simulating an unerupted tooth, and the coronoid process of the mandible appearing on the film just behind the third superior molar.

It is entirely probable that dark areas at the apices of teeth are, in many instances, due to the destructive effect upon the process resulting from arsenic employed in devitalizing pulps. A small quantity of arsenic runs out through the foramen, producing the same effect upon the alveolus as upon the pulp. This would mean necrosis, but without infection. On the other hand, a dark area at the apex of the root is undoubtedly due in many instances to an imperfect root canal filling. I hesitate to speak upon this subject because I recognize the extreme difficulty which confronts the dentist in the management of many of these cases of root canal fillings. Often the canal is twisted and curved, and many times so thread-like that it would seem impossible to carry a gutta percha point or other material to the foramen. And yet open and unfilled spaces are breeding-places for infective processes. No doubt in many instances these dark and infected areas are due to defective root canal fillings where there seem to be insuperable obstacles to the achievement of the end desired. Important as root canal filling is, there would seem to be ample justification for many failures, especially in the molar region.

In cases of pyorrhea alveolaris there can be no question as to the significance of these dark

areas. They are areas of infection due to diminished resistance of the alveolar process to the attack of the germs, which appear to be normally present at times in every mouth. The appearance which pyorrhea presents on the film is characteristic. It is not the apex that is here chiefly involved, but the whole process—the interdental spaces as well as the apices.

It is frequently possible to differentiate between an abscess and a necrotic condition of long standing by the shape of the dark area. An acute abscess is sharply marked off from the surrounding healthy tissue. A necrotic condition of long standing has ragged and irregular edges.

Enough has been said to point out the necessity for care in interpreting dental films. Dark areas are not always indicative of infection, nor do they in all cases point to the necessity for extraction, or even treatment. They ought to be considered in the light of all the facts which the intelligent radiographer can gather from a careful consideration of the case. Patients ought not to be lightly advised to submit to a complete extraction of their teeth. No artificial dentures can ever take the place of the teeth which nature has furnished, even if the latter are not perfect. Teeth may willingly be surrendered if they are undeniably the sources of infection, but the case ought to be fairly well made out before giving such counsel. Dental roentgenography may be regarded as a most valuable aid in reaching a final judgment upon a most important question. In reaching this judgment, skill in interpreting the film is quite as important as technic in taking it.

My purpose has been chiefly to warn against possibilities of error in the interpretation of dental films. I might add that an area of infection at the root of a tooth might coincide with a neuritis or an arthritis or a possible cachexia, and yet not be the cause of it. Here, as in the interpretation of dental films, a certain caution in reaching conclusions might well be exercised.

#### PREPARATION OF ANIMAL FOOD PROTEINS FOR ANAPHYLACTIC TESTS.\*

BY R. P. WODEHOUSE AND J. M. D. OLTMSTED, BOSTON.  
[From the Medical Clinic of the Peter Bent Brigham Hospital, Boston.]

SINCE it is well known the proteins of some foods are frequently the cause of certain types of asthma and other anaphylactic diseases, and since by the application of the proteins from these foods by means of the skin test it is possible to determine the particular food which causes the disease, it is desirable to have for the skin test suitable preparations of all the foods that enter into the average diet. Such preparations must be in a form convenient to handle,

\* These preparations were made for the "Studies on Bronchial Asthma" (*Jour. Med. Res.*, 35, *et seq.*) at the Peter Bent Brigham Hospital, Boston.

and must also be as concentrated as possible, in order to make the tests certain. For preliminary tests, however, it is not necessary or even desirable to have the individual proteins, which occur in each of the foods, separated one from another. Otherwise, each food would have to be represented by three, four or often more individual proteins, thus greatly increasing the necessary number of tests to be made.

In order to produce the skin reaction, the proteins must be in a soluble form. Although many proteins become insoluble after being heated, this does not prevent the use of heat in making these preparations, because, as it has been shown, foods which ordinarily are eaten in a cooked condition give the skin test after being cooked for the table as well as or even better than when raw. Consequently, in making these preparations, from foods which are generally eaten in a cooked form, heat was applied in making the extracts. This, of course, entirely eliminated the heat coagulable proteins from these preparations unless they happened to be partly hydrolyzed by the cooking, in which case the products of hydrolysis would enter into the preparation.

No attempt was made to remove entirely other substances, because any lengthy process of purification would be liable to alter the nature of the proteins so that the preparations would not be the true anaphylactogenic representatives of the foods from which they were made.

It is necessary that preparations for this purpose should keep indefinitely, be convenient to handle and not be subject to putrefaction from air contaminations. For this reason they are dried and kept in the form of a powder.

For making these preparations the method used by the authors<sup>1,2</sup> in the preparation of vegetable food proteins was modified in such a way as to be adaptable to meat and fish, since it yields the proteins in a highly concentrated form, and the preparations made by it are anaphylactogenically representative of the foods in the form in which they are generally eaten.

In general the method is as follows. The material is ground very fine in a meat chopper and heated with approximately two volumes of water to 90° C. for one-half hour. The liquid is then strained off through cheesecloth and allowed to stand for a few days (using toluol as preservative); at the end of this time fats, if any, collect at the surface and are removed, the liquid is decanted from the sediment which usually settles out, and is filtered. Filtration is often slow and difficult on account of the gummy nature of the extracts. However, it is always possible to obtain eventually a clear or slightly opalescent filtrate. This filtrate is then exposed in large evaporating dishes upon the warm water bath before an electric fan until nearly dry (with chloroform as preservative). The result is usually a more or less hygroscopic gummy substance. This is then dissolved in as

small an amount of water as possible and added to three or four volumes of 95 per cent. alcohol. This always causes the formation of a gummy or even syrupy precipitate which, probably on account of the hygroscopic nature of the peptones contained in it, shows a great avidity for water. Dehydration, however, can be completed by boiling and triturating in absolute alcohol, acetone and ether. The thorough washing given in these reagents also serves to remove all fats, oils and waxes. In removing the proteins from the baths of alcohol, acetone and ether, centrifugation is used in preference to filtration, since the process can thus be completed in much less time and with much less exposure to the atmosphere. This is important on account of the extremely hygroscopic nature of most of these preparations which in the presence of alcohol or acetone take up water so freely that an exposure of a few minutes is sufficient to render them liquid again; in this regard the animal food proteins show strong contrast to the vegetable food proteins. After the last ether bath the protein is removed to a sulphuric acid desiccator and drying is completed *in vacuo*. The result is always a friable powder which is readily soluble in water or dilute alkali.

The animal foods which we have so far prepared by this method are the following:

Pork	Haddock	Mackerel
Beef	Cod	Lobster
Lamb	Salmon	Oyster
Chicken	Halibut	Clam

(long necked)

In making the preparation from oysters alone the general method was deviated from in that heat was not applied. The oysters were simply ground and macerated in cold water for several days (with toluol as preservative). This was deemed advisable, because oysters are eaten raw as often as cooked.

When chemical tests were applied to these preparations, it was found that all gave the ordinary protein color reactions. The biuret was always red or reddish, and the precipitation reactions such as are obtained with phosphomolybdic, phosphotungstic, trichloracetic, picric acid, etc., indicated that in all cases the preparations consisted mainly of proteoses and peptones. No quantitative tests were made to determine the percentage of protein, but the qualitative tests showed that the proportion of protein in these preparations is very large.

This method of macerating the fish or meat in water, hot or cold, according to its nature, and precipitating the extract so obtained by alcohol, then thoroughly washing this precipitate in alcohol, and drying in absolute alcohol and ether, yields preparations which contain the protein in a form highly concentrated and representative of the food as it is generally used.

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## BODY TYPES IN EPILEPTICS.\*

By MORGAN B. HODSKINS, M.D., PALMER, MASS.  
Monson State Hospital.

I HAVE been much interested in the work of Dr. John Bryant and Dr. Joel E. Goldthwait in their study of body types and the relation of these types to disease, especially their possible relation to epilepsy.

Bryant divides the human family into three types: the carnivorous, the herbivorous and the normal. Goldthwait, in the Shattuck Lecture for 1915, described these types fully.

In the lecture just referred to, Goldthwait says, "The characteristics are equally apparent in childhood as in adult life." Therefore, the study was first undertaken on young patients, with the idea that they were better prospects for treatment. The oldest patient in this group was twenty-four years of age, the majority being between twelve and fifteen years of age.

There are one hundred and fifteen patients included in this study, which, on analysis, gave forty-seven carnivores, 40.8%; eight herbivores, 6%; and sixty normals, 52.1%.

The causes of the epilepsy in the carnivores, as determined by the clinical examination, are as follows:

Idiopathic, twenty-two; indigestion, seventeen; meningitis, four; diphtheria, two; hydrocephalus and alcohol poisoning, one each.

In the normal group the determined causes were: encephalitis, sixteen; meningitis, ten; cerebral hemorrhage, seven; birth injury, three; rachitis, six; blow on head, congenital syphilis, diphtheria, pneumonia and sunstroke, one each; measles, two; idiopathic, four; indigestion, seven.

On further analysis we find that, in the carnivorous group, 10% were due to organic causes, and in the normal group, 60%. In the carnivorous group we find six different factors to account for the onset in forty-seven cases. In the normals, thirteen factors account for sixty cases. Thirty-six per cent. of the carnivores and 48% of the normals had a hereditary tendency.

The average age at onset of the disease in the carnivorous group was 5.1 years, in the normals 2.85 years.

The group of eight herbivores was too small for profitable analysis.

\* A contribution to the William Leonard Worcester Memorial Series of Danvers State Hospital Papers, presented Nov. 19, 1915.

## Book Reviews.

*The Epidemic of Poliomyelitis in New York City in 1916, Based on the Official Reports of the Bureaus of the Department of Health.*

A monograph of four hundred pages which incorporates a series of extensive reports of the infantile paralysis epidemic of 1916 has been issued by the Department of Health of New York. Beginning with a historical sketch of the disease and proceeding with the record of the epidemic in this City, with a reference to the extent of its spread elsewhere in the United States, the report deals with every phase of the disease as seen by the Department of Health, in co-operation with other departments of City, State and Federal Government, and with many official and unofficial advisory groups and organizations. The data here presented will render possible the widest use of the observations of the officers of the Department of Health by those engaged in the study and practice of preventive medicine in general and this dreaded disease in particular.

*The Starvation (Allen) Treatment of Diabetes, with a Series of Graduated Diets.* By LEWIS WEBB HILL, M.D., AND RENA S. ECKMAN. Third Edition. Boston: W. M. Leonard. 1917.

THE first edition of this convenient manual of the newer treatment of diabetes was reviewed in the issue of the JOURNAL for October 7, 1915 (Vol. clxxiii, p. 551); and the second edition was reviewed in the issue for March 9, 1916 (Vol. clxxiv, p. 357). The appearance of this third edition within so short a time is evidence of the merited success with which the work has met.

The third edition has been generally revised and is increased by sixteen pages over the second. The diet lists and references have been rewritten and increased in number. The endeavor has been made to add such data as may increase the value of the book to physicians and patients. Particular attention is directed to the table presenting the analyses of diabetic foods done by the Connecticut Agricultural Experiment Station and exposing many of the foods, flours and meals advertised for diabetics as not only valuable but dangerous. The series of graduated diets has been completely revised and indexed; and in accordance with the latest advances in the knowledge of diabetes, most of these new diets contain less fat than there was in the old series, emphasizing the present belief in the important rôle played by a high fat intake in the production of acidosis. The book needs no introduction and may be expected to continue with increased efficiency its service to the profession.

## THE BOSTON Medical and Surgical Journal

*Established in 1812*

An independently owned Journal of Medicine and Surgery published weekly, under the direction of the Editors and an Advisory Committee, by the BOSTON MEDICAL AND SURGICAL JOURNAL SOCIETY, INC.

THURSDAY, JULY 19, 1917

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**SUBSCRIPTION TERMS:** \$5.00 per year, in advance, postage paid, for the United States; \$6.56 per year for all foreign countries belonging to the Postal Union.

An edition will be in the editorial office daily, except Sunday, from twelve to one-thirty p. m.

Papers for publication, and all other communications for the Editorial Department, should be addressed to the Editor, 126 Massachusetts Ave., Boston. Notices and other material for the editorial pages must be received not later than noon on the Saturday preceding the date of publication. Orders for reprints must be made in writing to the printer. Orders for reprints must be made in writing to the printer. The Journal will furnish one hundred reprints free to the author, upon his written request.

The Journal does not hold itself responsible for any opinions or sentiments advanced by any contributor in any article published in the Journal.

All letters containing business communications, or referring to the publication, subscription, or advertising department of the Journal, should be addressed to:

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126 Massachusetts Ave., Corner Boylston St., Boston, Massachusetts.

### A NEW THEORY OF DREAMS.

It has not been long since Dr. Freud startled the scientific world with his new system of psychology, in which the interpretation of dreams plays such a prominent part. Owing to the enthusiasm of the supporters of his dream theory and the ardency of its detractors, most physicians are quite well aware of its essentials. They are, briefly, that every dream is the representation of a repressed wish; that besides its actual manifest content, a dream has a latent content which must be discovered; that there are numerous psychic mechanisms at work in dreams,—repression, distortion, symbolism, condensation, etc. Besides Freud's original theory, some of his disciples and his followers have elaborated many variations of this. Thus Stekel sees death and bisexuality in every dream, Adler thinks it is a

representation of the individual's sense of inferiority, and Maeder holds that it has the function of indicating a solution of the conflict—in other words, of pointing out, in symbolic language, perhaps, the road out of the difficulty.

Just at this time it is instructive to hear the subject of dreams presented, not in order to make a violent attack upon the psychoanalytic school, but merely as an attempt to epitomize scientific knowledge. This has been done by Dr. Robert Armstrong-Jones, who gave the result of his studies in a recent address to the Abernethian Society as reported in the *Lancet* for November 25, 1916. After giving some attention to the historical aspect of the subject, he discusses the relation which dreams bear to the senses, finding that the majority of them relate to sight, and only a very small percentage of them to hearing, taste, and smell.

Dr. Armstrong-Jones considers that the characteristic feature of dreams, considering them as mental processes, is that the will is in abeyance, while cognition and feeling play prominent parts. These three factors, which he considers the *sine qua non* of mental processes, become dissociated then in dreams and the will refuses to act. This he holds in spite of the not uncommon assertion by certain persons that they can direct their dreams. Speaking briefly of the psychoanalytic dream theory, the lecturer held that the chief danger was in arbitrarily investing dreams with a ruling thought, such as sex, when in reality other instincts, such as fear, anger and hunger may just as commonly figure in them.

Dr. Armstrong-Jones believes that impressions and associations which had been discarded during our waking hours as not pertinent to our welfare, find their way into the sleeping life and by reason of the fact that they had been given no scrutiny during our waking hours present a vague, disconnected appearance. Thus the parts of the mind that have been occupied throughout the day with certain essential ideas are allowed to relax, these ideas are stored away, so to speak, and new ideas are brought forth, other sections of the brain come into play and allow the ponderous parts to rest.

### PROFITING BY THE MISTAKES OF OUR ALLIES.

If the medical profession, in conducting its part in the present war, may learn from the mistakes of the English and French to their advantage, they must urge the matter of proper

selection of physicians for military service. Large numbers of doctors will be needed not only to care for our own troops, but to fill the vacancies left by the lack of forces among the Allies, not only on the western front but in Russia and other eastern points. To supply her army's needs, France depleted the staffs of her medical schools, her civilian hospitals and laboratories. Those who remained were insufficient to give proper training to the coming medical classes and to afford proper protection to the civilian population. England made the same mistake. She accepted all the physicians who volunteered for the army and later found her medical ranks thinned to an alarming extent. There is today in this country, roughly speaking, one doctor for every 700 of our population. In England there are large sections where there remains only one doctor for every 8000 population, and France is in a worse plight. Therefore, whether such system is made into law or not, we must apply to the calling of our medical force the same principles that control the draft of the Army. Those that can be spared at home must go, those who are more useful at home should be kept there. Our great city hospitals must not be crippled, and at all costs we must preserve adequate faculties for our medical schools, and keep them in full operation, so that the ranks of medicine may always have recruits. Medical students should be exempt from draft and not accepted for volunteer service.

eight schools have been established. These are at Boston, New York, Baltimore, Richmond, Philadelphia, Kansas City, Mo., Los Angeles, and Chicago. The school in Boston opens on or about the twentieth of July. The course of study covers the practical application of roentgenology, with clinics at the hospitals, special work on localization of foreign bodies, military administration and the scientific study of apparatus. Major A. W. George is in charge. Members of the Medical Reserve Corps or those who prefer to receive commissions in the Medical Reserve Corps as military roentgenologists can, upon receiving their commissions, be assigned to one of these several schools of instruction, by application to the Surgeon-General's Office, Washington, D. C.

#### MEDICAL NOTES.

**BRITISH BIRTHDAY HONORS FOR PHYSICIANS.**—The list of British honors, recently conferred upon the occasion of the observance of the King's birthday, contains the names of a number of physicians. Among these Dr. Frederick Taylor, president of the Royal College of Physicians of London, and an active member of the Central War Committee, has been created a baronet. The honor of knighthood has been conferred on a number of physicians, notably Col. Robert Jones, C.B., A.M.S., inspector of military orthopedics, and Surgeon-General Eugène Fiset, long an officer on the permanent staff of the Canadian Army Medical Corps.

"He went with the first Canadian contingent to South Africa, serving throughout the war and being taken prisoner. For his services at Paardeberg he received the D.S.O. In 1905 he became Director-General of Medical Services, Canada, but in 1907 he took over the work of the deputy Minister of Militia during the illness of the incumbent of that office; after that minister's death he succeeded to the post. Sir Eugène Fiset's place as Director-General being taken by Surgeon-General Carleton Jones. Sir Eugène Fiset was largely responsible for the organization of the Canadian contingent sent to take part in the present war. The honour of knighthood is also conferred upon Sir Thomas Kennedy Dalziel, who is lecturer on Clinical Surgery in the University of Glasgow, and surgeon to the Western Infirmary; on Sir E. C. Stirling, C.M.G., professor of physiology in Adelaide University, at one time lecturer on the subject at St. George's Hospital, and a well-known authority on the anthropology of Central Australia; and on Sir Herbert Waterhouse, surgeon to Charing Cross Hospital and Dean of the school, who has recently returned after

#### TRAINING IN MILITARY ROENTGENOLOGY.

A PLAN put forward by the Council of National Defense, for the establishment of schools in military roentgenology, was noted in the JOURNAL for May 17, 1917 (Vol. clxxvi, No. 20).

At that time a committee consisting of twenty-seven roentgenologists was appointed by the president of the American Roentgen Ray Society to provide means whereby instruction could be given to men desirous of entering the medical corps as roentgenologists. The duties of this committee were to canvass the country for a complete list of medical men available for military roentgenology, to establish schools in different geographical centers where uniform instruction could be obtained and to prepare a manual of military roentgenology. The work of organization has now been completed and

serving for nearly a year with the Anglo-Russian hospitals in Russia. Of the military honours, the first to catch the eye is the promotion of Sir Arthur Sloggett, K.C.B., Director-General with the British armies in France, already C.M.G., to be K.C.M.G. The same honour is conferred upon Surgeon-General Tom Percy Woodhouse, C.B., who was the D.M.S. of the original expeditionary force, and now holds the onerous and exacting office of D.M.S. of the lines of communication; and upon Surgeon-General Francis Treherne, C.M.G., who was D.M.S. in Mesopotamia during the reorganization of the medical arrangements of the expeditionary force there. The other recipient of this honour is Colonel Robert Neil Campbell, C.B., I.M.S., who was in command of the Pavilion Military Hospital for Limbless Soldiers, Brighton. Lieutenant-Colonel P. J. Freyer, who is made K.C.B., retired from the Indian Medical Service some years ago, but has long been consulting surgeon to Queen Alexandra's Military Hospital, Millbank. Soon after the war began he became consulting surgeon to the Indian Hospitals at Brighton, and afterwards consulting surgeon to the Eastern Command, with charge of the county of Sussex. The same honour has been conferred on Colonel James Magill, A.M.S., who served with the Guards Camel Regiment during the Nile campaign of 1885, and was severely wounded at Abu Klea. He also served during the South African war."

**MOVING PICTURES IN TEACHING.**—The use of moving pictures in photographing surgical operations has been tried and proved successful. The proceedings of the annual meeting of the American Institute of Dental Teachers, held in January, 1917, records the use of moving pictures to teach dentistry. The Clinical Film Company of New York, who have been successful in making records of surgical operations for educational purposes, became interested in testing out the possibilities of motion pictures for use in the illustration of lectures in dental schools. Six reels were made and presented to the Association. Reel No. 1 showed a method of filling a cavity in the grinding surface of a molar tooth with a non-cohesive gold foil filling by the cylinder method and hand pressure. Reel No. 2 showed an operation for the removal of teeth under nitrous oxide anesthesia. Reel No. 3 showed a prophylactic treatment of dentures. No. 4 illustrated the removal of impacted third molars by two methods. No. 5 showed a root amputation under anesthesia and No. 6 illustrated the system of dental hygiene and prophylaxis employed in the Bridgeport, Conn., public schools. The demonstration was received with enthusiasm by the association.

**LARGE CHARITABLE BEQUESTS.**—By the will of the late Colonel Oliver H. Payne of New York, one of the largest owners of Standard Oil Stock,

the Lakeside Hospital of Cleveland, Ohio, is the recipient of a gift of \$1,000,000. St. Vincent's Charity Hospital of the same city receives \$200,000.

#### WAR NOTES.

**DR. ALEXIS CARREL'S ARRIVAL.**—The arrival in this country of Dr. Alexis Carrel is announced. Dr. Carrel reached New York on July 4 and will give valuable assistance to the establishing in this country of proper hospital facilities for the care of the wounded.

**WAR RELIEF FUNDS.**—On July 13 the totals of the principal New England war relief funds reached the following amounts:

French Wounded Fund .....	\$237,884.20
Armenian Fund .....	199,836.74
Permanent Blind Fund .....	117,686.63
French Orphanage Fund .....	115,061.99
Surgical Dressings Fund .....	105,173.47
Serbian Hospitals Fund .....	96,333.44
Italian Fund .....	42,643.42
La Fayette Fund .....	28,298.03
War Dogs' Fund .....	806.25

#### BOSTON AND MASSACHUSETTS.

**WEEK'S DEATH RATE IN BOSTON.**—During the week ending July 7, 1917, the number of deaths reported was 211 against 215 for the same period last year, with a rate of 14.25 against 14.74 last year. There were 29 deaths under one year of age, against 32 last year, and 65 deaths over 60 years of age against 57 last year.

The number of cases of principal reportable diseases were: diphtheria, 53; scarlet fever, 13; measles, 128; whooping cough, 11; tuberculosis, 55.

Included in the above were the following cases of non-residents: diphtheria, 5; tuberculosis, 13; whooping cough, 2.

Total deaths from these diseases were: diphtheria, 6; scarlet fever, 2; measles, 2; tuberculosis, 35.

Included in the above were the following cases of non-residents: diphtheria, 1; scarlet fever, 1; tuberculosis, 5.

**SHARON SANATORIUM.**—The extension of the work of the Sharon Sanatorium, to include the treatment of tuberculous children, is an endeavor worthy of this excellent institution and merits the loyal support of the public.

The Sharon Sanatorium was established twenty-six years ago, in 1891, for the treatment of tuberculosis arising in women of refinement and limited means. It was the first of its kind in New England; and the first to prove that tuberculosis could be successfully treated in low altitudes, not far from the sea, in a rough, changeable climate. It is now known throughout the United States as a pioneer and model institution. Its success, after a short time of experimentation, was such that several years later a State Sanatorium at Rutland, Massachusetts,

the first one of many such state institutions, was opened for the very poor.

As a fitting mark of its twenty-fifth anniversary, the Children's Pavilion was begun in 1916 for the treatment of tuberculous children under fourteen years of age, and this is now well under way on the Sanatorium grounds. It is to be an open-air school and sanatorium. The importance of early treatment of suspected tuberculosis in children cannot be overestimated. The officers of the Sanatorium are, therefore, exceedingly desirous that the benefit of their experience may be immediately made available to children, and are asking that money, not only for current expenses but for the endowment fund and the Children's Pavilion, may be provided in generous quantity. Checks and pledges may be mailed to any member of the following committee: Dr. Vincent Y. Bowditch, chairman, William T. Sedgwick, Dr. Joel E. Goldthwait, Mrs. Charles A. Porter, Nathaniel H. Stone, Mrs. Henry P. King and Jeremiah Smith, Jr.

#### NEW ENGLAND NOTES.

**NEW ENGLAND TUBERCULOSIS CONFERENCE.**—A conference on tuberculosis, to include all New England, will be held in Rutland, Vermont, on October 4th and 5th of this year. A committee of fifty in the New England states has been appointed to help make this conference a success. Local members of this Committee are as follows:

Dr. Edward O. Otis, Boston; Dr. Arthur K. Stone, Boston; Dr. Vincent Y. Bowditch, Boston; Dr. Allen J. McLaughlin, State Com. of Health, Boston; Mrs. Thomas Conant, Gloucester; Dr. Donald B. Armstrong, Framingham; Seymour H. Stone, Boston; Dr. John B. Hawes, 2nd, Boston; Miss Mary Van Zile, Beverly; Dr. Joseph H. Pratt, Boston; Dr. I. J. Clark, Haverhill; Dr. George L. Schadt, Springfield.

Many phases of the tuberculosis problem will be dealt with. Because of the relation of tuberculosis to the war the conference should attract many delegates from different parts of New England.

#### The Massachusetts Medical Society.

#### NOTES FROM THE DISTRICT SOCIETIES.

**FRANKLIN.**—The regular bi-monthly meeting of the Franklin District Medical Society was held at the Mansion House, Greenfield, on Tuesday morning, July 10, at 11.15 o'clock.

The following papers were read: "Management of Labor," by Dr. G. P. Twitchell; "Ear Complications of Infectious Diseases," with case reports, by Dr. F. A. Millett.

DR. H. N. HOWE, Pres.,  
DR. F. A. MILLETT, Sec.

#### Miscellany.

#### UNITED STATES VITAL STATISTICS IN 1915.

The census bureau of the United States Department of Commerce has recently completed and issued a survey of birth and death rates in the United States in 1915, affording a basis of comparison with similar statistics in other countries.

"In the recently established birth-registration area of the United States—comprising the six New England States, New York, Pennsylvania, Michigan, Minnesota, and the District of Columbia, with an estimated population of 31,150,000, representing 31 per cent. of the total for the United States—776,304 infants were born alive in 1915, representing a birth rate of 24.9 per 1,000 of population. For every state in the registration area and for most of the cities there was a substantial excess of births over deaths, but this excess was most pronounced in those localities in which the proportion of foreign population is largest. The mortality rate of infants under 1 year of age averaged 100 per 1,000 births, ranging from 70 in Minnesota to 120 in Rhode Island, and, among places having 25,000 inhabitants or more, from 54 in Brookline and Malden, Mass., to 196 in Shenandoah, Pa. These are among the significant facts presented in a preliminary statement just made public by Director Sam. L. Rogers of the Bureau of the Census, Department of Commerce.

"This statement—giving, as it does, the first Federal statistics of births ever published—makes possible a comparison of birth rates in the registration area of the United States and in foreign countries, and throws light on such matters as the extent to which the populations of the states and cities in the birth-registration area are increasing through excess of births over deaths, the relation between the birth rate and the rate of infant mortality, the relation between the birth rate and the racial composition of the population, etc.

"The birth rate for the birth-registration area as a whole in 1915—24.9 per 1,000 population—exceeded the death rate for the same area—14 per 1,000—by 10.9 per 1,000, or nearly 78 per cent. That is to say, if the birth and death rates prevailing in that year were to remain unchanged, and if no migration were to take place to or from the area to which the figures relate, its population would increase annually by 10.9 per 1,000, or by nearly 1.1 per cent. The birth rates of the registration states ranged from 21.1 in Maine to 26.7 in Connecticut and Michigan; and the death rates ranged from 10.1 in Minnesota to 16.1 in New Hampshire. The highest death rate was thus much lower than the lowest birth rate. The greatest excess of births over deaths—14.4 per 1,000 population—appears for Minnesota, and the smallest—5.5 per 1,000—for Maine.

"The statistics cover 96 cities and towns having, at the last census, 25,000 inhabitants or more. Of these, there were only three—Kingston and Troy, N. Y., and Norristown, Pa.—in which the deaths exceeded the births in 1915, and in each case the excess was small, being greatest—1.1 per 1,000 population—for Troy.

"The cities showing the highest five birth rates are: Detroit, Mich., 37.9; Chicopee, Mass., 37.6; Niagara Falls, N. Y., 37.5; New Britain, Conn., 36.4; and Chelsea, Mass., 34.5. The death rates for these cities—15.7, 14.7, 16, 11, and 14.3, respectively—were, with the single exception of that for New Britain, higher than the average for the birth-registration area but were far below the maximum death rate shown for any city in the area—21.7, for Norristown, Pa.

"The lowest five birth rates appear for Brookline, Mass., 12.7; York, Pa., 17.5; Kalamazoo, Mich., 18.2; Kingston, N. Y., 18.5; and Troy, N. Y., 18.6. The death rates for the first-named two places were lower than the average for the registration area, and those for the first-named three were lower than the corresponding birth rates; but for Kingston and Troy the death rates—18.6 and 19.7, respectively—exceeded the birth rates.

"The relation between the birth rate and the constitution of the population in respect of race and nativity is of great interest. For the six cities in the registration area in which the colored population at the last census either numbered more than 10,000 or represented more than 10 per cent. of the total, separate figures are given for the white and colored races; and in all but one of these cities—Washington, D. C.—the birth rates shown for the colored population were lower than those for the whites. It is probable, however, that the registration of births is less nearly complete among colored than among white persons, and that therefore the rates shown for the former class are too low. The death rates for the colored population are higher, and in many cases much higher, than those for the whites.

"The birth statistics do not, of course, show the number of children per family, but some indication of the fecundity of the native and foreign elements of the population may be obtained from a comparison between the proportion which the number of foreign parents formed of the total number of white parents to whom children were born in 1915 and the proportion which foreign-born persons represented of the total white population in 1910. From such a comparison it appears that far more births occur annually to foreign-born parents, proportionally to their number, than to native parents. In Connecticut approximately 30 per cent. of the white population in 1910 was of foreign birth, but nearly 63 per cent. of the white parents to whom children were born in 1915 were reported as natives of foreign countries. The corresponding percentages for the other states

and the District of Columbia are as follows: Maine, 15 and 28; Massachusetts, 31 and 58; Michigan, 21 and 35; Minnesota, 26 and 33; New Hampshire, 22 and 44; New York, 30 and 56; Pennsylvania, 19 and 40; Rhode Island, 33 and 59; Vermont, 14 and 25; District of Columbia, 10 and 17.

"Thus, on the assumption that the proportions of native and foreign-born persons in the total white population did not change materially between 1910 and 1915, it appears that the birth rates for the foreign-born population in most of these states and in the District of Columbia are nearly or quite twice as high as the rates for the native and foreign elements combined, and that, on the other hand, the rates for the natives are considerably lower than those for the entire white population, being little more than half as high in the case of Connecticut and less than two-thirds as high in the case of Massachusetts. On the basis of these figures—which of course represent only an approximation to the facts—the excess of the birth rate among the foreign-born population over that among the natives ranges from about 40 per cent. in Minnesota to about 300 per cent. in Connecticut. It should be borne in mind, however, that the proportion of the population in the reproductive period of life is considerably greater for the foreign born than for the natives.

"The rate of infant mortality—that is, the number of deaths of infants under 1 year of age per 1,000 born alive—is of particular interest. This rate, for the registration area as a whole, was 100 in 1915. This is practically equivalent to saying that of every ten infants born alive, one died before reaching the age of 1 year.

"Among the ten states these rates ranged from 70 for Minnesota to 120 for Rhode Island; and among the 96 cities and towns it varied from 54 for Brookline and Malden, Mass., to 196 for Shenandoah, Pa. The maximum rate was thus nearly four times as high as the minimum.

"It might be expected that a high rate of infant mortality would accompany a high birth rate, but an examination of the figures fails to disclose any well-defined relationship of this character. Among the States, both the highest and the lowest infant-mortality rates—120 for Rhode Island and 70 for Minnesota—are found in connection with birth rates—23.1 and 24.5 per 1,000 population, respectively—which are below the average for the registration area; and, moreover, the birth rate in the State with the lowest infant mortality is higher than that in the State with the highest infant mortality.

"Among the cities and towns the lowest infant-mortality rate—54 per 1,000 births—is shown for both Brookline and Malden, Mass. The former place had the lowest birth rate—12.7 per 1,000 population—given for any city or town in the registration area, but the birth rate of the latter—23.5 per 1,000—was not far below the average for the area. The highest infant-

mortality rate—196 per 1,000 births, for Shenandoah, Pa.—is accompanied by a birth rate—32.7 per 1,000 population—which is far above the average, although considerably below the maximum. Of the ten cities in which the birth rates were highest, three show infant-mortality rates lower than the average, and of the ten places in which the birth rates were lowest, five show infant-mortality rates higher than the average.

"The statistics compared with foreign tables show that England, France, Belgium, Sweden and Switzerland before the war had a lower birth rate than the United States had in 1915. Countries with a higher rate were Germany, Austria, Russia, Italy, Spain, Denmark, Holland, Japan and Australia."

#### COMMUNICABLE DISEASES IN MASSACHUSETTS IN 1916.

Dr. Eugene R. Kelly, director of the division of communicable diseases of the Massachusetts State Department of Health, has recently issued his annual report for the year 1916, dealing particularly with epidemics of infectious diseases during that year and in the preceding decennial.

"A compilation of the deaths caused by ten of the most prominent communicable and preventable diseases shows that during the year just passed there were slightly more than 9000, or 17 per cent. of all the deaths. Twenty years ago deaths from these same diseases amounted to 13,600, or 30 per cent. of the deaths from all causes, and at the same time the population of the State was about 1,250,000 less than it is today.

"Although the number of cases in certain diseases showed marked increases, the total number of cases in all diseases last year was 68,488, and in 1915 was 71,900. Among those showing great increases are infantile paralysis, which spread to 1793 more persons in 1916 than it did in 1915, measles with an increase of 3300, anthrax and trichinosis. Twenty cases of the latter were traced to an infected hog which one slaughtering house refused and which was later taken and sold to some Italians.

"Among the diseases which showed a decrease are diphtheria, which fell from 9282 to 7338 cases; ophthalmia, which decreased 900 cases; scarlet fever, several hundred, and typhoid fever, 673.

"Perhaps the one fact which pleases the health authorities more than anything else is the record made in the fight against typhoid fever. In the year just past the authorities predict that there will be not more than 170 deaths from the disease at the outside, while there were 246 deaths from that cause in 1915. This, Dr. Kelly believes, is a rate for the State which has never been approached before, and he is confident that no other State has ever equalled it. In 1915 the

rate per 100,000 population was 6.7, and in 1916 he predicts that it will not be much more than 5, and possibly less.

"A compilation of figures in regard to the infantile paralysis epidemic also shows some surprising facts. The little town of Dalton led the State in the number of cases in proportion to her population and had a rate of 433, based on a population of 100,000. Amesbury is the next with a rate of 268, Holyoke third with 188, North Adams fourth with 172.4, and Pittsfield fifth with 161.9. Worcester had the lowest rate with 14.4; Lowell was next lowest with 15.7, and New Bedford third from last with a rate of 16.9. Boston is seventeenth in the list with a rate of 64.4, and Cambridge sixteenth with a rate of 65.6. Fall River and Brockton are the only large cities of the State which had less than fifteen cases of the disease.

"In connection with this disease, the report declares that the district health officer system has been given a great test, for, with the exception of the cases in a few of the large cities, these officers saw every infantile paralysis sufferer in the State and even those suspected of having the disease. Their knowledge proved of great assistance to the local boards of health, and was responsible for the reasonable regulations which were put in force, rather than some very drastic steps which might have been taken.

"The deaths from measles in the year just past will run far beyond those caused by scarlet fever. It is estimated that there will not be many more than 117 from the latter, while there were 307 deaths from measles up to Nov. 1, or twice as many as in 1915. There were more whooping cough deaths, although less cases than in 1916.

"Speaking of outbreaks, the report states that there were two of anthrax in Woburn and Winchester during the past year, but that the United States Government has remodelled its protective regulations since that time on the representations of the Massachusetts Health Department. Two outbreaks of diphtheria occurred in institutions, but antitoxin was administered early and no deaths resulted. One small contact epidemic occurred in Amherst with a sub-epidemic traced to milk. Fitchburg had an epidemic which was prolonged throughout the year and there were nineteen other distinct ones.

"The largest scarlet fever outbreak took place in Quincy, where 187 cases of the disease resulted from unrecognized carriers. A small outbreak occurred in Clinton from milk. Two outbreaks of smallpox, both of them traced to a single source, occurred in Fitchburg and Lee and Great Barrington. Nine persons contracted the disease in the former and eighteen in the latter.

"There was only one typhoid epidemic of any consequence during the year, and that occurred in Lynn during the summer. In all 114 cases resulted, although the carrier was never discovered. Fall River also had a milk epidemic

of twenty-eight cases, and there were three other small outbreaks from milk in which the typhoid was traced to the dealer.

"The laboratory work of the health department has shown an increase of thirty-four per cent. over that of other years, and diagnosed chiefly diphtheria, typhoid and tuberculosis.

"The Health Department has been aided greatly by the secretary's office towards making the record of deaths more complete. That office was forced to reorganize its whole routine in order to accommodate the health department, and now the records are made up monthly, only a month behind, whereas before they were at least a year behind."



#### BOSTON VITAL STATISTICS IN 1916.

THE Boston Health Department has recently issued a provisional statement of the vital statistics of this city for the year 1916. During this year the total death rate of the city was 16.72 as compared with 16.06 in 1915, the lowest figure recorded. The increase was due to several epidemics of streptococcus throat infection, the epidemic of poliomyelitis, and the Summer Street bridge accident. Not all death reports for the year have yet been received, so that the figures are only approximate and subject to subsequent modification.

"The deaths for the year numbered 12,717, compared with 12,021 in 1915. Of the total for 1916, deaths of non-residents numbered 1795, compared with 1640 in 1915, and known deaths of Bostonians outside the city numbered 675, compared with 704 in 1915. Corrected for these two factors, the 1916 death rate per 1000 population is 15.25, compared with 14.81 in 1915."

The total number of deaths in 1916 showed an increase of 696 over the previous year.

"Non-residents dying in Boston account for some of this increase, as there were 155 more than last year. Each year more and more non-residents take advantage of our hospitals, these constituting 14 per cent. of our ~~total~~ deaths, and as these deaths must be figured in our death rate, it can be seen how our death rates are kept high. This feature is especially noticeable in the communicable diseases. Surrounding cities and towns send their cases here for treatment. Of the 26 deaths from typhoid fever, 7 of them were non-residents. Scarlet fever was much higher—almost 50 per cent., of 19 of the deaths being those of non-residents of Boston; diphtheria showed 52 of these non-residents.

"During the early part of the year, the outbreak of influenza and pneumonia was responsible for an increase of more than 200 deaths. To this increase may be added the increase of 164 deaths from poliomyelitis, and the unfortunate electric-car accident at South Boston, which caused 48 more.

"It is gratifying to note the decrease in the

number of deaths from typhoid fever, scarlet fever, diphtheria and whooping cough; the low number of deaths from typhoid fever and the typhoid fever death rate being the lowest ever attained in this city, and up to this writing the lowest ever reached by any large American city having more than 350,000 population.

"While the total number of deaths of children under one year was 10 more than in 1915, and the infant mortality rate was 105 per 1000 births reported against 104 last year, some significance must be placed on the fact that there were outbreaks of influenza, pneumonia, and anterior poliomyelitis, all at different periods during the year, resulting in a great number of deaths of infants under one year of age.

"Only on two other occasions since 1882 has there been a lower number of deaths of children under one year of age. In this connection it might be said that nurses of this department visited almost 15,000 babies, and made subsequent visits totalling about 75,000."

The total number of births reported in 1916 was 19,583 and the infant mortality rate was 105 per thousand births reported.

With reference to the West End Health Unit on Blossom Street, Dr. Mahoney says in his statement accompanying the report that: "On March 1, 1916, through the efforts of His Honor the Mayor, there was inaugurated in the West End section of the city a health unit which has since developed into a civic center as well. This was established for the purpose of getting in close touch with the people and determining what effect education of the people, through the co-operation of all health agencies in the district, would have on the prevention of disease and deaths amongst infants and children and adults in that congested area of the city.

"His Honor felt that the first place to start such an institution would be where the congestion was greatest and in a section that contained the greatest number of people per acre.

"The success of the Unit soon became apparent and wonderful results were accomplished for the people of the district during the hot summer of last year. Nurses, visitors and physicians kept constantly in touch with the people using the Unit as headquarters, and with the outbreak of poliomyelitis in the city the advantages of the Unit were shown to a still greater extent.

"The Unit seemed to be a Mecca for the afflicted and the worried, and the women and children came with their troubles, and often times imaginary illnesses, only to be sent home with their fears allayed and themselves comforted. The physicians and nurses kept in close touch with the people during this outbreak, and the security that the people in the district felt in having such assistance about them did much to help them."

## PREPARATIONS OF UNITED STATES ARMY MEDICAL CORPS IN MEXICO.

REPORT from San Antonio, Texas, on November 24, 1916, described in detail the preparation which, during the previous summer, had been made at the Mexican frontier by the United States Army Medical Corps, for the care of sick and wounded troops, in the possible event of actual hostilities with Mexico.

"Within the last five months the most complete medical organization known to the United States Army has been developed to care for the 15,000 State and regular troops stationed at Border points and in Mexico. The system includes five base hospitals, located at strategic points; eight camp hospitals, a cantonment hospital at Columbus, N. M., and twenty-six ambulance companies and forty-one field hospitals.

"The base and camp hospitals will accommodate 4600 patients and have medical and surgical facilities equal to the finest hospitals. Not more than half the beds have been occupied at any one time since the nation's militia strength was called into the Federal service.

"Back of this array is the potential organization. A hospital train of ten Pullman cars, capacity 250 patients, would transport patients from the camp to the base hospitals and from base hospitals to general military hospitals in various parts of the country, should a campaign in Mexico be undertaken. These larger institutions are the Walter Reed Hospital at Washington, D. C., the General Army and Navy Hospital at Hot Springs, Ark., and the Lettman Hospital at San Francisco. About 1200 beds are vacant in the three hospitals at the present time.

"In addition, a number of army posts have been selected for transformation into general hospitals in case of emergency. This list includes Fort McPherson, at Atlanta; Fort Oglethorpe, also in Georgia; Fort Benjamin Harrison, Indianapolis, and other army stations where barracks are available for hospital purposes.

"The medical corps has complete equipment in storage for twenty evacuation hospitals and two base hospitals. An evacuation hospital takes care of 300 patients and a base hospital accommodates 500, so the total reserve equipment ready for use at a moment's notice is sufficient for 6000 men. Evacuation hospitals are entirely under canvas and are intended for use along an extended line of communication.

"The base hospitals now in service are located at Fort Sam Houston, Fort Bliss, Brownsville, Eagle Pass and Nogales. Serving feeders for these institutions are the camp hospitals located at the following points: Laredo, 120 beds; Del Rio, 75 beds; Marfa, 150 beds; Deming, 180 beds; Douglas, 300 beds; Ilano Grande, 200 beds; McAllen, 150 beds; and Fort Clark, 150 beds.

"Last July when State troops began arriving at the Border the only army establishments for

the care of sick were the post hospitals at Fort Sam Houston and Fort Bliss, and much smaller places at Laredo and a few other Border points. Practically the entire system of base and camp hospitals has been built since the call on the National Guard was made.

"As a result of the scientific methods adopted by the medical corps and the steps taken to insure absolute sanitation in Border camps, the big command of regulars and militia has set a new health record. From May 1 to Oct. 31, there were only 75 deaths from disease in the force of more than 150,000, and of this small number, only 21 deaths were due to infectious maladies.

"Typhoid fever was formerly the worst scourge of camp, but it has no place among the troops along the Mexican Border. May 1, to Oct. 18, only 24 cases of typhoid developed and no deaths resulted from the disease. All of these cases were among the National Guard organizations, where in some cases the men were not inoculated with typhus serum until after regiments had come to the Border. There was not a single case among the 42,000 troops of the regular army engaged in patrol duty and stationed in Mexico with General Pershing's command.

"In Spanish-American War days—over a period of eight months in 1898—among 147,000 regulars and volunteers, the typhoid epidemic reached the enormous total of 21,000 cases and there were 2192 deaths from the disease.

## ANNUAL CONFERENCE, MASSACHUSETTS SOCIETY FOR MENTAL HYGIENE.

THE recent conference on feeble-mindedness held by the Massachusetts Society for Mental Hygiene, was marked by a series of addresses of much value and interest. Chief among them may be mentioned the address by Dr. Guy G. Fernald on the results of mental examination of young adults at the Concord Reformatory. He stated, among other things, that forty-four per cent. of the inmates of that institution are subnormal mentally and fifteen per cent. are feeble-minded. This statement is based on a study of 1107 individuals. Only forty per cent. he rates as normal and responsible, the other sixty per cent. are made up of psychopathies, epileptics, congenital syphilites, sex perverts, the insane and feeble-minded.

The group of feeble-minded, 15 per cent. of the whole, he feels should be segregated from the others. "Members of this group are demonstrably defective and of limited responsibility, and as such should not be sentenced to serve with the fully responsible," he said, "but should be committed to a specially adapted environment for indefinite custodial care and training, with a view to their return to society only when such return would not be a menace."

"Absolute physical separation of the group

is of vital importance, and preferably this should be in a farm colony of which the hospital and laboratory features are prominent. Until such segregation is made possible, work in the interest of the prisoner who is normal mentally is greatly handicapped."

Dr. Fernald urged, also, that psychiatric clinics be established in connection with the courts, so that offenders of this type may be committed to custodial care.

Speaking on what he termed practical methods for protection, education, supervision and segregation of the feeble-minded, Dr. Walter E. Fernald advocated the following plans: Long-continued scientific study and research of all phases of feeble-mindedness; governmental cognizance of all neglected and uncared for feeble-minded persons; continued census for the unfortunate; extra institutional supervision of all uncared-for defectives; special classes for the education on this subject in all cities and towns; mental clinics for diagnosis all over the State; mental examination of persons accused or convicted of crime and the education of lawyers, teachers, physicians and clergy as to the nature of feeble-mindedness.

Dr. Elizabeth A. Sullivan, resident physician at the Massachusetts Reformatory for Women at Sherborn, said that only 10 out of 234 women admitted to the institution were free of disease and possessed of adult intelligence. She urged the need of separating the feeble-minded from reformatories and said that 4000 of the feeble-minded women discharged from the Sherborn Reformatory should have been placed in a suitable institution instead of being set adrift in the world.

The problem from the point of view of the social worker was brought out by J. Prentice Murphy, general secretary of the Boston Children's Aid Society, who stated that annually about 300 unmarried mothers, or one-third of the whole number in the city, call upon that Society for aid, and that in a group of 250 feeble-minded mothers none could tell the name of her child's father. Some of these feeble-minded women have as many as six illegitimate children. Mr. Murphy advocated the separation of the mother from her baby and its care being entrusted to the State. Twenty charitable organizations in Boston have under their care 1600 persons who have been diagnosed as defective mentally.

Dr. V. V. Anderson, psychiatrist, Boston Municipal Court, in speaking on the subject of feeble-mindedness as seen in court, gave the following statistics:

"Not more than 10 per cent. of the offenders brought to the Boston Municipal Court are feeble-minded, but that 10 per cent. is most troublesome, mainly because society has not yet come to recognize its needs. Out of 100 cases 75 per cent. are not self-supporting, and 34 per cent. do not work at all. These 100 have a record of 1825 arrests and 735 sentences. The chances are

four to one that they will not conduct themselves normally for six months when placed on probation. It would have been more profitable for society to have recognized these cases earlier and segregated the 75 per cent. who have a mental level below 12 years of age."

#### SELF-CONTROL IN DIET.

In Southern California, several ages ago, the oil escaping from a small spring formed in a depression of the earth, a little pool. The lighter portions of the oil evaporated, leaving the sticky asphalt. From time to time the rains covered the surface of the pool with water, animals and birds came down to drink, sank into the asphalt and were imprisoned in this gigantic animal trap. The hungry wolves saw there before their eyes fresh animal food of every sort, from the enormous mastodon to the smallest bird. They, too, were drawn into the trap as were also the large sabre-toothed tigers which then roamed that vicinity. Today scientists are engaged in excavating the bones deposited there by indiscreet appetite.

The aim of civilization is to create inhibition, the quality which holds back and directs to useful purposes the natural appetites, preventing them from leading man into the pitfalls which beset over-indulgence. Hunger is the great stimulus of action, but when it is satisfied to satiety, sudden inactivity follows. If the natural appetite is allowed to dominate it leads to over-indulgence, and the unwary victim suddenly finds himself in a trap from which he cannot escape.

One of the great elements in maintaining health is the regulation of the bodily intake to meet the appetite. The man who works with his hands requires more food than the brain worker. The man who labors in the open air needs more nourishment than he who sits cooped in an office all day long. Give the sedentary worker the appetite of the day laborer and if that appetite be uncontrolled the body will become clogged with the poisonous products of its own manufacture, and physical deterioration will surely follow. It is just as bad to eat too much as it is to eat too little. To indulge the appetite to too great an extent is equally as pernicious as its constant repression. The best is to be found in an average course, neither over- nor under-indulgence, neither the following of the inelastic dietary nor the promiscuous and ill-considered use of foods. Many a so-called case of dyspepsia is nothing in the world but the rebellion of an overworked stomach, the remonstrance of a body which has been stuffed to repletion. A great deal has been accomplished in the reduction of infant mortality because we are able to control what infants may eat. Adults must for themselves exercise this as self-control. If this is done there will be a decline in our adult mortality rates and an increase in health and efficiency.

#### RECENT DEATHS.

BROOKS HUGHES WELLS, M.D., of New York City, died at the home of his sister in Southport, Conn. on July 6 of injuries received in being thrown from a bicycle. Dr. Wells was a captain in the Medical Reserve Corps and was well and favorably known as a surgeon. He was connected with various New York hospitals, including the Polyclinic. He was born in New Haven, Conn., in 1859. He is survived by his widow and four daughters.

#### MARRIAGES.

The marriage is announced of Miss Marguerite Mayberry of Pittsfield, Mass., and Dr. William Franklin Temple, Jr., of Boston. Dr. Temple graduated from the Harvard Medical School in 1911.